Affective, cognitive, and physiological mechanisms of stress regulation in adolescents: The role of emotional intelligence

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A thesis submitted in partial fulfilment of the University's requirements for the Degree of Doctor of Philosophy

2020

University of Worcester

ABSTRACT

Stress is a normal part of adolescence, yet young people differ markedly in their vulnerability or resilience in the face of everyday stressors (Wright, Masten, & Narayan, 2013). Research has begun to investigate whether emotional intelligence (EI), a set of adaptive traits and skills involving the perception, understanding, use, and regulation of emotions (Zeidner & Matthews, 2018), acts as a 'stress buffer', that operates within risk trajectories to safeguard mental health and well-being (e.g., Keefer, Saklofske, & Parker, 2018; Mikolajczak, Petrides, Coumans, & Luminet, 2009). However, there is a pressing need to conduct more process-oriented EI research, especially in adolescent populations (Fiori, 2009; Peña-Sarrionandia, Mikolajczak, & Gross, 2015).

This programme of research explores how and when EI, measured as both an ability (AEI), and as a trait (TEI), acts as a potential stress buffer, through direct effects on the stress response, and indirect effects on emotion regulation (ER) mechanisms. Across three studies (total *n* = 318, age range = 16 - 18 years), the research tests the extent to which EI moderates several ER processes under stress, as identified from Gross' ER framework (1998a; 1998b). These include 'early' effects (e.g., attentional biases), and 'later', more effortful processes (e.g., coping style), in addition to direct moderation of the stress response itself (e.g., psychological and physiological reactivity). EI's effects are examined in the context of both an *active* stressor (acute psychosocial stress) and a *passive* stressor (exposure to distressing posts on social media).

While findings are mixed, they suggest that EI *does* sometimes bestow protection for adolescents when faced with stressors, and moderates several processes within response trajectories (notably, attentional deployment and response modulation), beyond the influence of higher-order personality traits and general cognitive ability. However, these effects are context dependent. Specifically, certain facets of *TEI* appear most useful when adolescents experience acute psychosocial stress, whereas when confronted with highly emotive material on social media, *AEI* seems more pertinent. The work suggests both the trait and ability approaches to the study of EI offer valuable insight into adolescent adaptation, and represents a positive step forward in our pursuit to understand how EI might lead to positive life outcomes in young people.

ACKNOWLEDGEMENTS

First and foremost, I would like to first thank my supervisory team: Dr. Sarah Davis, Dr. Bérénice Mahoney, and Professor Pamela Qualter, for their continued support, encouragement, enthusiasm, and academic contributions. I have been very lucky to have such a wonderful and supportive team, and have learnt a lot from working with you over the last few years.

I am very grateful to the teaching staff at the schools that took part in my research for their enthusiasm, and whose help in facilitating the research was invaluable. I would also like to thank each and every one of the young people who kindly gave up their time to participate in my research. Without you, this research would not have been possible.

A big thank you is also due to my PhD peers at the University of Worcester (you know who you are!), who have been an invaluable and unwavering source of support throughout. Heartfelt thanks also go to my friends and family, and my parents in particular, whose belief in me has never faltered – thank you.

Finally, I would like to dedicate this thesis to one of my dear friends, Aisha Coggan, a fellow PhD student who sadly passed away from cancer in 2017. Aisha and I were the same age, and we graduated with BScs in Biology from the University of York together. We both went on to start doctorates, but sadly Aisha never got to finish, and was awarded hers posthumously. I wish we could have celebrated becoming Doctors together, but I am submitting this thesis for the both of us.

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LIST OF ABBREVIATIONS

AEI/AEI(EM)/AEI(EP): Ability emotional intelligence/emotion management/emotion perception

ANS: Autonomic nervous system

CITS-S: Coping Inventory for Task Stressors (situational version)

EDA: Electrodermal activity

EI: Emotional intelligence

EIP: Emotion information processing

ERT: Emotion recognition test

ER: Emotion regulation

FFM: Five Factor Model

Gf/Gc: Fluid intelligence/crystallised intelligence

HR: Heart rate

IAPS: International Affective Picture System

Mini IPIP: Mini International Personality Item Pool

MSCEIT: Mayer-Salovey-Caruso Emotional Intelligence Test

NA: Negative affect

PA: Positive affect

PANAS: Positive and Negative Affect Schedule

SEL: Social and emotional learning

SHS: Subjective Happiness Scale

SSST: Sing-a-Song Stress Test

STEM/STEM-B: Situational Test of Emotional Management/Brief

STEU/STEU-B: Situational Test of Emotional Understanding/Brief

SWB: Subjective well-being

SWLS: Satisfaction with Life Scale

TEI: Trait emotional intelligence

TEIQue/TEIQue-AF/ASF/CF: Trait Emotional Intelligence Questionnaire/Adolescent Form/Adolescent Short Form/Child Form

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AN OVERVIEW OF THE THESIS

1.1 Context of the research

Emotional intelligence (EI) refers to a set of adaptive traits and skills involving the perception, understanding, use, and regulation of emotions (Zeidner & Matthews, 2018). EI can be conceptualised as either a trait (TEI; a constellation of emotional self-perceptions assessed through self-report questionnaires, akin to personality; Petrides, Pita, & Kokkinaki, 2007), or an ability, in which EI comprises emotion-related cognitive abilities, measured via maximum performance tests, similarly to IQ (AEI: Mayer, Roberts, & Barsade, 2008). Since its conception in the 1990s (Salovey & Mayer, 1990), there has been an abundance of research identifying associations between EI and a range of adaptive life outcomes. For young people, notable outcomes have included better mental health (e.g., Fernández-Berrocal, Alcaide, Extremera, & Pizarro, 2006; Schutte, Malouff, Thorsteinsson, Bhullar, & Rooke, 2007), improved well-being (e.g., Austin, Saklofske, & Egan, 2005; Chamorro-Premuzic, Bennett, & Furnham, 2007), and educational attainment (MacCann, Jiang, Brown, Double, Bucich, & Minbashian, 2020). Despite a lack of understanding of how and when EI leads to those benefits, there has been a proliferation of EI training programmes, underpinned by the expectation that EI is a universally positive and adaptive construct to cultivate in young people (e.g., Castillo-Gualda, Cabello, Herrero, Rodríguez-Carvajal, & Fernández-Berrocal, 2017).

Many individual differences, such as personality or IQ, are generally assumed to be relatively stable, with the exception of natural changes over the lifespan. For example, the personality trait conscientiousness generally increases with age (Debast, van Alphen, Rossi, Tummers, Bolwerk, & Derksen, 2014; Wagner, Lüdtke, & Robitzsch, 2019), and IQ scores typically decrease with normal ageing (Miller, Myers, Prinzi, & Mittenberg, 2009). In contrast, EI (particularly TEI) appears to be more malleable and susceptible to environmental influences and training efforts, and thus a target for intervention. Academic and public interest in EI has also prospered as a result of the culture-driven concern with the positive role of emotions, and the growing discipline of positive psychology. The subsequent focus on cultivating ‘soft skills’ or ‘character strengths’ (e.g., self-regulation, empathy, optimism, resilience) in young people (Ciarrochi, Atkins, Hayes, Sahdra, & Parker, 2016; Shoshani & Steinmetz, 2014; Suldo, 2016) is reflected in an upsurge of EI training initiatives in schools, often falling under the general rubric of ‘social and emotional learning’ (SEL) or ‘emotional literacy education’ (Zeidner, Matthews, & Roberts, 2012a). EI can be trained directly (i.e., designed according to a specific EI model, e.g., Castillo-Gualda, et al., 2017), or indirectly (e.g., through mindfulness interventions; Jung et al., 2016).

The aims of EI training and SEL are similar, but distinct. EI training aims to “systematically develop critical social and emotional competencies” (Nathanson, Rivers, Flynn, & Brackett, 2016, p.1), whereas SEL aims to enable individuals to “acquire and effectively apply the knowledge, attitudes and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions” (Collaborative for

Academic, Social and Emotional Learning, 2019). While SEL and EI training are not interchangeable terms, their respective aims both highlight the zeitgeist of cultivating protective factors to produce resilient young people through emotional education. However, unlike SEL, which can be somewhat broad and unscientific, EI-based programmes have stronger theoretical foundations (Humphrey, Curran, Morris, Farrell, & Woods, 2007). Indeed, the British-based Social and Emotional Aspects of Learning initiative (Department for Education, 2005) suggests EI should be a guiding concept for practice. Both SEL and EI training programs typically include specific activities and strategies designed to boost emotional traits and/or abilities (e.g., Weare, 2010). For example, students are trained to recognise and label their emotions using a mood-meter in the RULER programme, which is firmly grounded in the four-branch ability EI model (Nathanson et al., 2016). The INTEMO project involves class discussions on strategies to use when difficult emotions in the classroom (i.e., emotion regulation), and the acquisition of emotional vocabulary (i.e., emotion knowledge) through playing games (Ruiz-Aranda, Castillo, Salguero, Cabello, Fernández-Berrocal, & Balluerka, 2012a). Although the amount, nature, and quality of Personal, Social and Health Education (PSHE; which covers SEL) varies considerably between schools in England, SEL has remained high on the agenda of UK schools, even during periods of significant political and economic flux (Allen, 2011; Powell, 2019; Turner, Sutton, Harrison, Hennessey, & Humphrey, 2019).

Broadly speaking, any intervention designed to promote mental health and well-being should be informed by a sound theoretical framework (Millar, & Donnelly, 2014), and SEL interventions are no exception (Gresham, 2017). However, because many SEL programmes (and subsequent evaluations) are not *specifically* designed to address EI, the level of EI content in them is often insufficient and only relates to EI tangentially (Matthews, Zeidner, & Roberts, 2002). This is exemplified by a recent qualitative study (Wood, 2020) in which 402 staff members across 38 UK schools were interviewed, to explore how they aimed to improve student EI through their school's own idiosyncratic SEL programmes. Findings indicated that schools varied considerably in how they conceptualised EI, which consequently impacted the enactment of SEL, and the ways in which staff worked with students to develop their social, emotional, and behavioural skills (Wood, 2020). Thus, because SEL interventions are often broad, there is a risk that the nature and operationalisation of emotional skills could be misinterpreted without the supporting foundation of an EI theory-informed framework (Humphrey et al., 2007).

As a result of the heterogeneity in school ethos, practices, and extent to which interventions incorporate EI content explicitly, the evidence base concerning their effectiveness is mixed. While meta-analyses often reveal that SEL programmes can promote positive social, emotional and behavioural outcomes, when compared to a control group (usually a 'waiting list' condition) (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Sklad, Diekstra, De Ritter, Ben, & Gravesteijn, 2012; Wigelsworth, Lendrum, Oldfield, Scott, ten Bokkel, Tate, & Emery, 2015), effects are often small to moderate, and dependent on many factors (e.g., programme length, involvement of the programme developer in the evaluation). However, the validity of the outcome measures of such studies is often questionable, since few actually use EI measures at baseline or during post-study evaluations. The majority of interventions opt for outcomes considered to be *influenced* by increased EI to some extent. For example, the ongoing INTEMO program for adolescents has demonstrated better psychosocial adjustment (e.g., lower levels of depression, anxiety, social stress, higher self-esteem) (Ruiz-Aranda, Salguero, Cabello, Palomera, & Fernández-Berrocal, 2012), and reductions in physical or verbal aggression (Castillo-Gualda et al., 2017). *Promoting Alternative Thinking Strategies* (PATHS; Greenberg, Kusché, & Riggs, 2004) is one of the only SEL interventions designed specifically to promote EI *and* to include EI as part of its framework. However, PATHS evaluations still neglect EI as an outcome measure, and instead use teacher-ratings of prosocial behaviour, and internalising and externalising problems as proxies (Humphrey, Barlow, & Lendrum, 2018). Thus, improvements in EI can only be inferred. Furthermore, programmes also rarely distinguish between whether their EI curriculum aims to train emotional *traits* or *abilities* (Qualter, Gardner, & Whiteley, 2007). This is an important distinction, because TEI and AEI have been long-established as separate constructs from both theoretical and empirical perspectives (O'Connor & Little, 2003; Petrides & Furnham, 2000; Warwick & Nettelbeck, 2004).

Given the limited public funding available for such programmes, ensuring cost-effectiveness is critical (Humphrey et al. 2018). However, independent economic evaluations of SEL programmes often suggest they are not cost-effective. For example, Berry et al. (2016) conducted a thorough examination the PATHS programme, in which 56 UK schools participated. Cost-consequence analyses of the randomised controlled trial revealed that the intervention demonstrated no statistically significant effects on child behaviour or emotional well-being, yet the average cost of PATHS was £139 per child. A more recent prospective economic evaluation of the same intervention (Turner et al., 2019) estimated that while the cost effectiveness of the PATHS curriculum was 84%, this dropped to 0% once teachers' salary and time were included with other costs (administration, materials, training), indicating the considerable uncertainty over the long-term cost effectiveness of such programmes. Furthermore, in that second trial, PATHS led to very small improvements in social and emotional outcomes (p < .10), and psychological well-being (p < .05), which dissipated by 12- and 24-month follow-ups. Ultimately, there is significant room for improvement with regards to the effectiveness of SEL and EI training programmes. Interventions are most effective when informed by a solid theoretical framework (Gresham, 2017), rather than on intuitive, idiosyncratic, or overinclusive accounts of EI (Zeidner, Matthews, & Roberts, 2012b). The core issue is that, while well-meaning, policies and school curricula have been keen to embrace EI training interventions before knowledge of the EI is underpinned by rigorous scientific investigation (i.e., the "cart before the horse"; Qualter et al., 2007). To move the EI field forward, many EI researchers have emphasised the need to examine the mechanisms of both TEI and AEI 'in action' (i.e., in situational contexts) (Fiori, 2009; Mikolajczak, Petrides, Coumans, & Luminet, 2009a; Mikolajczak, Roy, Verstrynge, & Luminet, 2009b). However, the processes underlying EI are often overlooked (Fiori, 2009; Mikolajczak & Luminet, 2008), and SEL (and even EI-based) interventions are unsupported with respect to processes (i.e., an understanding of how EI might lead to beneficial outcomes).

Once touted as an unequivocally 'bright' adaptive marker of mental health and well-being in young people, EI is now the subject of intense scientific scrutiny. Moreover, much of the EI training literature relates to children or young adolescents (i.e., under 16 years), despite the claims that EI holds a pivotal role in promoting adaptive functioning in older adolescents (Davis, 2018a). Before allocating scant public resources to rolling out EI training programmes, it is important to increase our understanding of if, how, when, and why, EI promotes adaptive outcomes for adolescents, particularly for those aged 16-18 years. Doing so will benefit the future design of high quality, effective, and age-appropriate interventions. Furthermore, if scientific investigations find that EI does not confer advantages (or even has detrimental effects; Davis & Nichols, 2016) for young people aged 16-18 years, it is ethically problematic that costly EI training programmes are being developed, endorsed, and implemented. Ultimately, we need to know more about how EI works.

One school of thought posits that EI may lead to resilience by facilitating adaptive stress regulation processes (Davis, 2018a; 2018b), since EI appears an especially useful individual-level resource under challenging circumstances (Keefer, Saklofske, & Parker, 2018; Mikolajczak et al., 2009a). Typically, those studies have employed a cross-sectional design to examine correlations between EI and some aspect of stress (e.g., perceived occupational stress, or life stress; Extremera, Durán, and Rey, 2007; Mikolajczak, Luminet, & Menil, 2006). While such work has been important for demonstrating associations between EI and adaptive stress outcomes, a process-oriented approach is needed to understand *how* EI may relate to stress regulation in context (i.e., when the individual is acutely stressed) (Davis, 2018b; Fiori, 2009). EI may lessen the effects of stress (and thus lead to its documented positive outcomes) through moderation of adaptive stress regulation processes. However, there is scant research of that nature. In particular, there is a dearth of evidence for adolescence, a developmental stage that involves intense emotional development, yet also numerous everyday stressors (Ahmed, Bittencourt-Hewitt, & Sebastian, 2015; Harper, Dickinson, & Bramwell, 2014). EI could play an important role with respect to buffering the effects of acute stress in adolescence, but research has not yet systematically explored that hypothesis.

The present programme of research endeavours to make several contributions to knowledge, by addressing prominent gaps in the evidence base. To reflect recommendations that the role of EI needs to be explored in different contexts, stress regulation processes are examined in both a lab-based context (i.e., in a stress induction paradigm), *and* an applied context (i.e., on social media). Both approaches utilise different stressors (i.e., psychosocial stressor; emotive social media posts), and data collection environments (i.e., controlled setting; online). Across these contexts, the research examines how EI contributes to several mechanisms of stress regulation. Using Gross' (1998a; 1998b) theory of emotion regulation as a framework, the influence of EI on the acute stress response will be considered from multiple perspectives, including attentional allocation (e.g., testing whether EI facilitates bias for emotive stimuli), cognitive change (e.g., testing whether EI relates to explicit coping), and response modulation (e.g., testing whether EI is associated with reactivity to, and recovery from, acute stress). Data obtained from the programme of research will therefore indicate whether the capacity of EI to buffer acute stress differs as a function of methodological and situational factors.

A further contribution of the research concerns the measurement of EI. Within the literature examining the stress-buffering function of EI, most studies focus on TEI, rather than AEI, yet understanding the contribution of both constructs is important (Fernández-Berrocal & Extremera, 2006). Moreover, some suggest that TEI and AEI may work *together* to achieve positive life outcomes (e.g., Davis & Humphrey, 2012a). Emotional skills (AEI) may be insufficient on their own - individuals must also feel confident in those skills (TEI) for them to translate into behavior (Keefer et al., 2018). The present research explores the role of EI from both trait *and* ability perspectives. In addition, the incremental effects of EI are examined, by controlling for confounding influences that form part of EI's nomological network (e.g., personality; Petrides et al., 2007; cognitive ability; Elfenbein & MacCann, 2017). Accounting for such constructs helps to produce as 'clean' an assessment as possible when establishing the roles of TEI and AEI (Davis, 2018b). All research is conducted with adolescents aged 16-18 years, an empirically neglected, but potentially vulnerable, population. Ultimately, the EI field requires research that addresses shortcomings in the literature relating to adolescent populations, process (i.e., *how* and *when* EI operates), and whether effects vary across contexts.

1.2 Philosophical stance, aims, and objectives

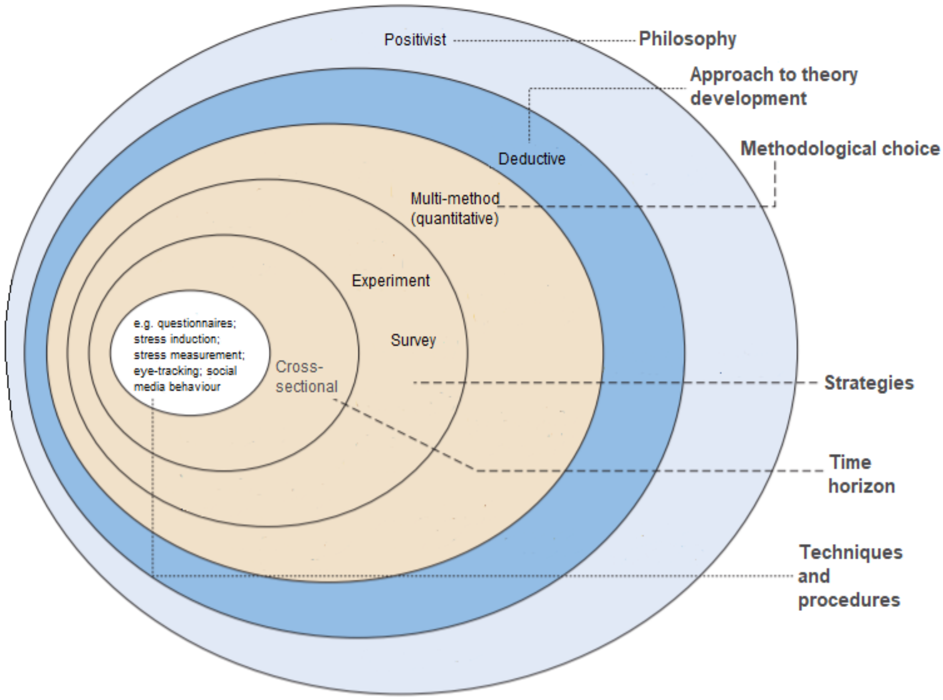
The research seeks to test the utility of EI as a 'stress buffer' in young people, by examining how EI moderates a range of stress regulation processes. EI might help protect adolescents from the pathogenic effects of stress directly, or, indirectly, through deployment of adaptive emotion regulation (ER) strategies and mechanisms, conferring resilience (Keefer, Parker, & Saklofske, 2009). The need for us to understand how EI may form a protective factor for adolescent stress (i.e., a buffer), and what this is contingent on (e.g., 'type' of EI; situational factors), calls for experimental approaches that isolate and manipulate specific variables under different conditions (Davis, 2018b; Mikolajczak et al., 2009a; 2009b). There is *also* a pressing need to compare how effects might vary between controlled settings, and real-world, *applied* settings. Thus, the research occupies a positivist epistemological position, which assumes that the creation of knowledge is based on empirical observation and the testing of specific hypotheses that predict the role of EI in relation to stress regulation processes (Haig, 2012). Broadly, the research examines whether observed empirical phenomena (i.e., emotional processing in stressful situations) fit with expectation (i.e., EI will relate to differences in emotion regulation processing to some extent). More specifically, hypotheses test whether EI moderates the stress response *directly* (e.g., by influencing affective or physiological responses to stress), or, indirectly, by moderating ER processes known to be integral to stress regulation. For the latter, these include 'early' effects (e.g., attentional biases), but also 'later', more effortful processes (e.g., coping style). There is also testing of a potential moderated mediation effect (e.g., where coping mediates the relationship between EI and stress reactivity, under stressful conditions). In line with recommendations for best practice, hypotheses in all three empirical studies were carefully constructed, driven by both theory (i.e., determined by what theorical principles suggest EI *should* do), and/or empirically driven (i.e., determined by what evidence suggests EI *does*), depending on the context (Asendorpf et al., 2013). From an ontological perspective, this assumes the existence of an objective reality (the basic paradigm of the scientific method), and attempts to quantify this through deductive scientific inquiry (Silverman, 2013), a means of theory generation particularly suited to the positivist approach of hypothesis testing (Snieder & Larner, 2009).

However, understanding complex phenomena requires complex methodology, a notion urged by the wider literature on mental health and well-being (Cloninger, 2004;

Diener, Pressman, Hunter, & Delgadillo-Chase, 2017). Thus, the research uses multiple data collection techniques and procedures, to systematically explore the role of EI in relation to affective, cognitive, and physiological mechanisms of stress regulation. For example, studies use standardised collection of numerical data, derived from both objective (e.g., eye-movements; heart rate), and subjective (e.g., self-reported mood; coping strategies) sources. Since the focus of the research is on *acute* stress, research is cross-sectional, to capture the workings of EI ‘in action’ (Davis, 2018b). The axiological perspective of positivist research is generally aimed at ensuring consistency, reliability, and minimising bias, whereby the researcher is independent from the data and maintains an objective “value-free” stance (Neuman, 2000). To work towards those values, studies the aim to elucidate the precise roles of the variables of interest (TEI; AEI), with interference from confounding variables controlled where possible (e.g., including potentially confounding influences as covariates in statistical analyses; standardised testing protocols). **Figure 1** uses Saunder, Lewis, &Thornhill’s (2007) research ‘onion’ to summarise the ‘layers’ of methodology used across the present programme of research.

Figure 1

Research 'Onion' Showing the 'Layers' of Methodology for the Current Research (Saunders' et al., 2007)



To investigate the role of EI in relation to stress regulation processes in older adolescents, there are three major aims and six objectives. Each objective relates to one or more of the three studies, hereby presented.

Aim 1: To explore how TEI and AEI relate to stress regulation processes in adolescents

> **Objective 1:** To explore whether the magnitude and duration of physiological (heart rate; skin conductance) and subjective (self-rated mood) stress reactivity and recovery in response to a situational stressor is directly moderated by TEI/AEI (Studies 1 and 2)

Objective 2: To test whether attentional processing of emotive material under stressful conditions is moderated by TEI/AEI, using an eye-tracking task (Study 2)

Objective 3: To use moderated mediation to determine whether coping strategies mediate the relationship between EI and stress reactivity, and whether this varies as a function of experimental condition (Study 1)

Objective 4: To test whether TEI/AEI moderates responses to highly emotive social media posts with respect to affective, attentional, and behavioural processes (Study 3)

Aim 2: To compare how TEI and AEI moderate stress regulation processes in different contexts

Objective 5: To compare findings from Studies 1 and 2 (laboratory studies), and Study 3 (online social media study), to assess if TEI/AEI contribute differently to stress regulation processes in different contexts (general discussion)

Aim 3: To examine whether TEI and AEI moderate stress regulation processes beyond confounding influences

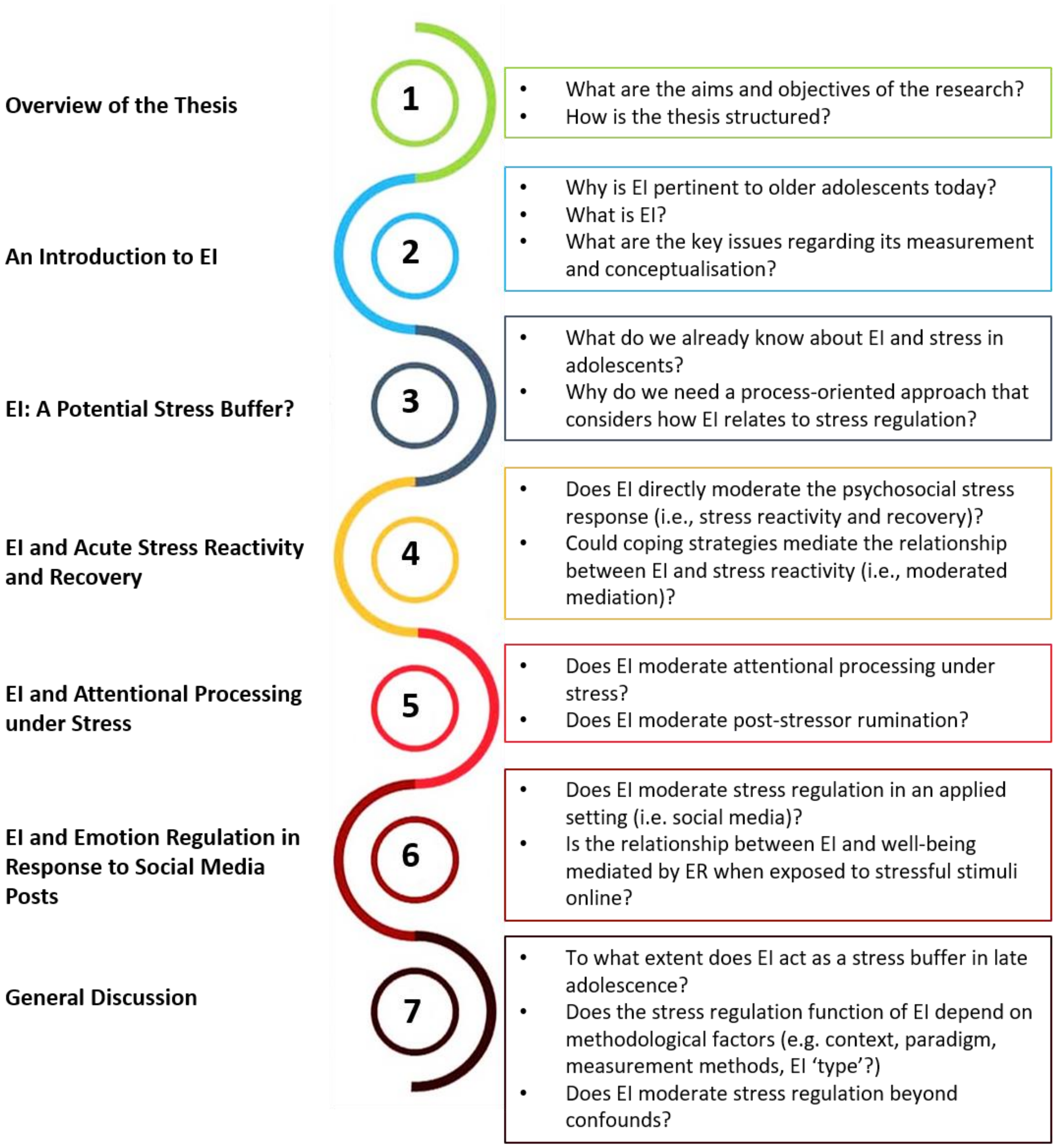
Objective 6: To test for incremental effects of TEI/AEI, by controlling for covariates of EI (e.g., personality; Petrides et al., 2007; cognitive ability; Elfenbein & MacCann, 2017) relevant to each analysis (Studies 1, 2 and 3)

1.3 Structure of the thesis

Chapter 2 provides an in-depth explanation of the EI concept (conceptualisations, definitions, measurement) and highlights its potential role within the adolescence resilience framework. The notion of EI as a stress buffer is then introduced, with a summary of the evidence base concerning EI, positive life outcomes, and stress regulation in adolescents (**Chapter 3**). The next three chapters present the three empirical studies undertaken. The first study (**Chapter 4**) tests whether EI predicts stress reactivity and recovery in the context of a laboratory social stressor. This forms the foundation for the second study, which replicates the first, but also tests whether EI predicts attentional processing under stress, using eye-tracking (**Chapter 5**). The final study (**Chapter 6**) investigates EI and emotion regulation in a more applied context: reacting and responding to emotive material on social media. **Chapter 7** provides a general discussion of the key findings, along with limitations, implications, and directions for future research. **Figure 2** shows the structure of the thesis, and indicates the key questions being addressed by each of the seven chapters.

Figure 2

Diagram Presenting the Key Questions Addressed by Each Thesis Chapter



Note. Chapters 1, 2 and 3 answer the questions by reviewing theoretical and empirical literature, whereas Chapters 4-6 answer questions through empirical study.

CHAPTER TWO

AN INTRODUCTION TO EMOTIONAL INTELLIGENCE

2.1 Chapter overview

This chapter first outlines the brief historical context of EI, and argues that EI may hold a pivotal protective role within an adolescence resilience framework. In particular, EI may be crucial for healthy emotion regulation in late adolescence, a time of 'storm and stress', that comprises not only intense emotional *development*, but also poses substantial emotion regulation *challenges* for some young people (Ahmed et al., 2015). After a discussion of EI's potential as a protective marker during adolescence, the chapter provides a detailed review of the current conceptualisations of EI, and coverage of the key issues for the trait and ability EI fields. Such challenges include establishing EI's nomological networks and issues surrounding measurement, especially in adolescent populations. The chapter concludes by highlighting the need to understand the processes through which EI facilitates positive life outcomes in young people.

2.2 What is EI?

Emotional intelligence (EI) is defined as a set of adaptive traits and skills that relate to perceiving, understanding, using, and regulating emotions effectively (Zeidner & Matthews, 2018). The concept of EI can be traced back to the notion of "social intelligence" (Thorndike, 1920), which referred to a person's ability to understand and manage others, and to engage in social interactions in an adaptive manner. Consideration for the importance and utility of emotions is therefore not new, and has emerged in several areas of psychology, such as psychoanalysis (e.g., Taylor, Parker, & Bagby, 1999), intelligence testing (Gardner, 1983), and developmental psychology (e.g., Denham, 1989). However, it was not until 1990 that the term EI was formally introduced into the scientific literature (Salovey & Mayer, 1990). In their seminal paper, Salovey and Mayer (1990) defined EI as "a set of skills hypothesised to contribute to accurate appraisal and expression of emotion in oneself and others, the effective regulation of emotion in self and others, and the use of feelings to motivate, plan, and achieve in one's life" (p.1). In 2000, the distinction between 'trait' and 'ability' models of EI was first presented (Petrides & Furnham, 2000), and is now standard in the scientific literature. Ability EI (AEI) concerns emotion-related cognitive abilities, measured via maximum performance tests, similarly to IQ (Mayer et al., 2008), whereas trait EI (TEI) refers to a constellation of emotional self-perceptions assessed through self-report questionnaires, akin to personality (Petrides et al., 2007). The conceptual differences between the two constructs are corroborated by empirical findings, which often demonstrate very low correlations between TEI and AEI (e.g., O'Connor & Little, 2003; Warwick & Nettelbeck, 2004). The TEI and AEI fields have developed relatively independently, with the TEI field the much larger of the two (Siegling, Saklofske, & Petrides, 2015a). Whilst there is consensus over the 'dual' approach, whereby TEI and AEI represent different theoretical frameworks underlying emotionally intelligent behaviour (Boyatzis, 2019), few studies examine the contribution of both types of EI, instead focussing on TEI *or* AEI (though usually, TEI). Much of the work being conducted to strengthen the theoretical foundations for EI (e.g., taxonomies) is conducted separately for TEI and AEI (e.g., AEI: Elfenbein & MacCann, 2017; TEI: Petrides, Mikolajczak, Mavroveli, Sanchez-Ruiz, Furnham, & Pérez-González, 2016).

In the early years of EI, the popular literature on EI far outpaced scientific research. Much of the popularisation of EI can be attributed to the publication of a single book, "*Emotional intelligence: Why it can matter more than IQ*", which highlighted the benefits of having high EI in the workplace, and has sold millions of copies worldwide (Goleman, 1995). Although Goleman's work was heavily criticised for lacking empirical support, and failing to suggest reliable and valid measurements of EI (Daus & Ashkanasy, 2003; Davies, Stankov, & Roberts, 1998; Perloff, 1997), a plethora of pseudoscientific EI models and texts followed. Many of those were developed primarily with commercial intentions, centred around self-help, or organisation-based applications, for example (e.g., Weisinger, 1998). However, the last two decades have also witnessed the construction of coherent theoretical EI frameworks (Petrides & Furnham, 2000), and the publication of numerous studies supporting EI as a strong predictor of life success (Brackett, Rivers, & Salovey, 2011). A considerable quantity of empirical evidence suggests that individuals with greater EI scores tend to be happier, healthier, and more productive, than those with lower EI scores (for overviews on EI and life success, see Brackett et al., 2011; Petrides et al., 2016). In particular, EI is theorised to play an important role during adolescence, the developmental period encompassing the transition from childhood to adulthood (e.g., Ruiz-Aranda, et al., 2012a).

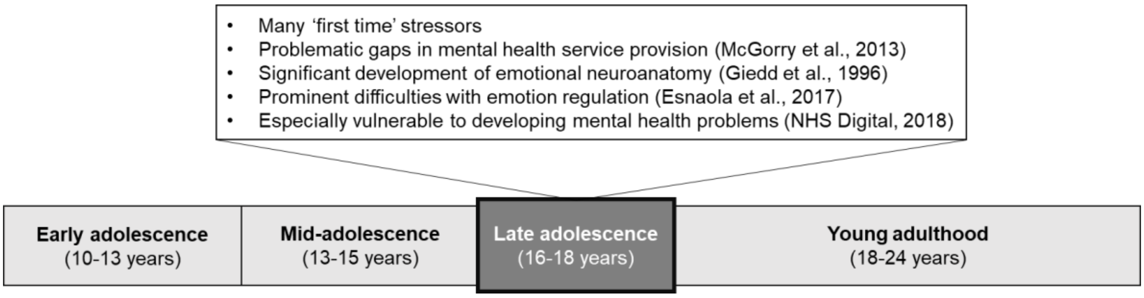
2.2 Is EI a protective marker during adolescence?

Adolescence has recently received an expanded and more inclusive definition, with the age window now suggested to span the ages of 10 and 24 years (Sawyer, Azzopardi, Wickremarathne, & Patton, 2018). As a time of 'storm and stress', adolescence involves emotional development, but can also produce substantial emotion regulation challenges for some young people (Ahmed et al., 2015; Riediger & Klipker, 2014). *Late* adolescence comprises an additional life stage between adolescence and adulthood. Young people aged between 16 to 18 years often experience this as an age of 'feeling in-between' (Arnett, 2004; 2012; Hendry & Kloep, 2012), with others describing older adolescents as a 'forgotten group', caught between child and adult, and between bureaucratic barriers (Kennedy, 2010). Older adolescents encounter multiple normative stressors, many for the first time (e.g., college exams, learning to drive, relationships, a first job, applying for university) (see **Figure 3**). Compared to when they were children, adolescents also self-report more daily hassles, more negative emotions, and fewer positive emotions (Larson & Ham, 1993), and are required to regulate these more independently (Steinberg, 2008). While many of the stressors mentioned are not exclusive to adolescents aged 16-18 years (for example, peer pressure is a persistent stressor across adolescent development; Byrne, Davenport, & Mazanov, 2007), evidence does appear to suggest that late adolescence yields unique and complex emotional challenges, as noted by Zarrett and Eccles (2006): "Although early adolescence has received much attention by researchers as a period of major distress, late adolescence has become a period of concern among developmental researchers and youth advocates" (p. 13). Moreover, interventions designed to improve social and emotional skills are often ineffective for older adolescents

(Yeager, 2017; Yeager, Dahl, & Dweck, 2017). To help design effective and age-appropriate interventions, more research is needed to understand the nuances in emotion regulation for older adolescents.

Figure 3

Diagram Depicting the Adolescent Developmental Stages, and the Features Characterising Late Adolescence as a Stressful Period



While the aforementioned stressors are normative, and not universally harmful for adolescents *per se*, they are problematic for some. Recent statistics suggest that approximately 16.9% adolescents in the UK have a mental health problem (Sadler, Vizard, Ford, Goodman, Goodman, & McManus, 2018), with social and emotional difficulties appearing especially pronounced for young people aged between 16 and 18 years. Young people of this age seem vulnerable to developing mental health issues compared with either pre-16 adolescents or post-18 adults (Harper et al., 2014; Sadler et al., 2018). For example, the number of 16-18 year olds seeking counselling about exam stress has increased by 68% since 2015, which is disproportionate to the increase observed for all young people (21%) (National Society for the Prevention of Cruelty to Children [NSPCC], 2017). The UK political landscape, which could exacerbate such issues in vulnerable young people, is also of note. In the UK, the structure of mental health service provision creates problematic ‘gaps’ between child and adolescent mental health services (CAHMS) and adult services (AMHS) (Joint Commissioning Panel for Mental Health, 2012; Jones, Hassett, & Sclare, 2017). Mental health services are deemed at their weakest, and least effective, during that 16-18 transition period (McGorry, Bates, & Birchwood, 2013).

The vulnerability of some 16-18 year olds to psychological issues is supported by neuroscientific research, which highlights this period as a key stage of brain development (Giedd et al., 1996; 1999). In particular, normative adolescent development during this time dictates functional maturation of the ventromedial prefrontal cortex (vmPFC), an area associated with a variety of emotional processes, including self-control, and decision-making (Heberlein, Padon, Gillihan, Farah, & Fellows, 2008; Wolf, Philippi, Motzkin, Baskaya, & Koenigs, 2014). Maturation of those prefrontal regions also facilitates new cognitive forms of ER (Casey, Jones, Levita, Libby, Patwell, Ruberry, & Somerville, 2010; McRae et al., 2012). It is therefore unsurprising that adolescents undergoing this important stage of development can sometimes experience problems with the regulation of affect and behaviour (Steinberg, 2005). Compared to adolescents aged 18-25 years (early adulthood), some adolescents aged 16-18 years are less skilled at understanding actions and consequences (Crone & Molen, 2004), and show more risk behaviours (Gardner & Steinberg, 2005). Skill and traits relating to stress regulation in particular seem to undergo development during this time (Esnaola, Revuelta, Ros, & Sarasa, 2017).

However, the ability to navigate those emotional challenges differs markedly between individuals; not all adolescents that encounter stressors develop psychological difficulties (Luthar, Sawyer, & Brown, 2006; Wright, Masten, & Narayan, 2013). Such individuals are often termed 'resilient', since they demonstrate positive adaptation despite experiencing adversity and threats to development. Investigation of resilience processes requires the identification of both risk factors (which make individuals *more* vulnerable to the effects of adversity), and protective markers (which enable *resilience* against the effects of adversity) (Olsson, Bond, Burns, Vella-Brodrick, & Sawyer, 2003; Masten, Hubbard, Gest, Tellegen, Garmezy, & Ramirez, 1999). Therefore, if EI helps individuals to moderate the impact of stressors (i.e., by acting as a stress buffer), then it should be considered a protective marker that facilitates resilience (McMahon, Grant, Compas, Thurm, & Ey, 2003).

There is already a substantial amount of evidence suggesting that individuals with high EI tend to achieve positive life outcomes, including good mental health (e.g., Fernández-Berrocal et al., 2006; Martins, Ramalho, & Morin, 2010; Resurrección, Salguero, & Ruiz-Aranda, 2014; Schutte et al., 2007), well-being (e.g, Austin et al., 2005; Chamorro-Premuzic et al., 2007), and academic achievement (MacCann et al., 2020). However, those studies typically only identify simple associations between EI and outcomes (e.g., high EI – low anxiety). For example, lower EI generally predicts higher levels of trait anxiety and depression in adolescent populations (Fernández-Berrocal et al., 2006; Schutte et al., 2007). Evidence also supports a relationship between TEI and *positive* psychological indices of well-being, such as life satisfaction and happiness (Austin et al., 2005; Chamorro-Premuzic et al., 2007; Petrides & Furnham, 2003; Livingstone & Day, 2005; Palmer, Donaldson & Stough, 2002). In almost all cases, higher TEI scores predict higher scores on aspects of well-being. However, the issue of circularity and contamination may be inflating this effect, since both constructs assess how positive a person's self-perceptions are (Keefer et al., 2018). This notion is somewhat supported by findings indicating that relationships between AEI, a more objective measure of emotional skill, and well-being, are weaker (Martins et al., 2010). Nonetheless, while the evidence linking EI with positive outcomes is convincing, it is currently unclear how having higher EI leads to those outcomes (i.e., resilience) in adolescents.

Resilience is not a static quality, trait, skill, or ability, but rather a dynamic interaction between risk factors and protective markers that can buffer the effects of adversity (Luthar & Cushing, 2002). Thus, identifying simple associations between EI and life outcomes does not tell us how EI confers resilience. To rigorously investigate *how* and *when* EI contributes to stress regulation, we need to conduct EI research that is more process-oriented (Peña-Sarrionandia, Mikolajczak, & Gross, 2015). Contextualised within a resilience framework, research has begun to investigate EI as a protective marker that operates within stress regulation pathways to lead to positive life outcomes in young people (e.g., Ciarrochi, Deane, & Anderson, 2002; Davis & Humphrey, 2012a; 2014; Mikolajczak, et al., 2006). However, there is still a need for research that assesses how EI relates to emotion regulation under adverse or stressful conditions, 'in action' (e.g., Mikolajczak, Nelis, Hansenne, & Quoidbach, 2008). Doing so will help characterise some of the mechanisms that might underpin the advantageous nature of EI. Progression towards testing that hypothesis is, however, hindered by other factors. For example, pronounced differences in how studies conceptualise EI (i.e., as a trait or an ability), and inconsistent consideration for the incremental effects of EI to predict outcomes over and above allied constructs (e.g., personality; Zeidner et al., 2012b; cognitive ability; MacCann, Joseph, Newman, & Roberts, 2014), continue to permeate the literature. Issues concerning measurement and conceptualisation of EI is provided later in this chapter, and a thorough review of the literature examining EI and stress regulation processes is provided in Chapter 3. Despite the dearth of knowledge concerning the mechanisms underpinning EI, there has been considerable interest in 'training' EI in children and young people over the last decade (Chapter 1). This is problematic, considering that we do not fully understand when and how EI functions with respect to resilience. Before highlighting what needs to be done to progress the EI field, it is important that to consider how EI is currently conceptualised and measured.

2.3 Conceptualising and measuring EI

One of the key challenges in the EI field is understanding its nomological network (i.e., deciphering the interrelationships between EI and related constructs). Following its introduction into the scientific literature, EI was met with concerns that the construct was simply "reinventing the wheel", "old wine in new bottles", or even "old wine packaged in new and glittering containers" (Zeidner et al., 2012b, p.22). Rapid popularisation of EI in the absence of a strong evidence base has led sceptics to describe EI as a poorly defined 'bandwagon' based on unreasoned claims (Murphy & Sideman, 2006). However, much work has been done to try and distinguish EI from, and integrate EI with, many other related constructs. EI often explains unique variance in life outcomes beyond that explained by related constructs, such as personality (for review and meta-analysis, see

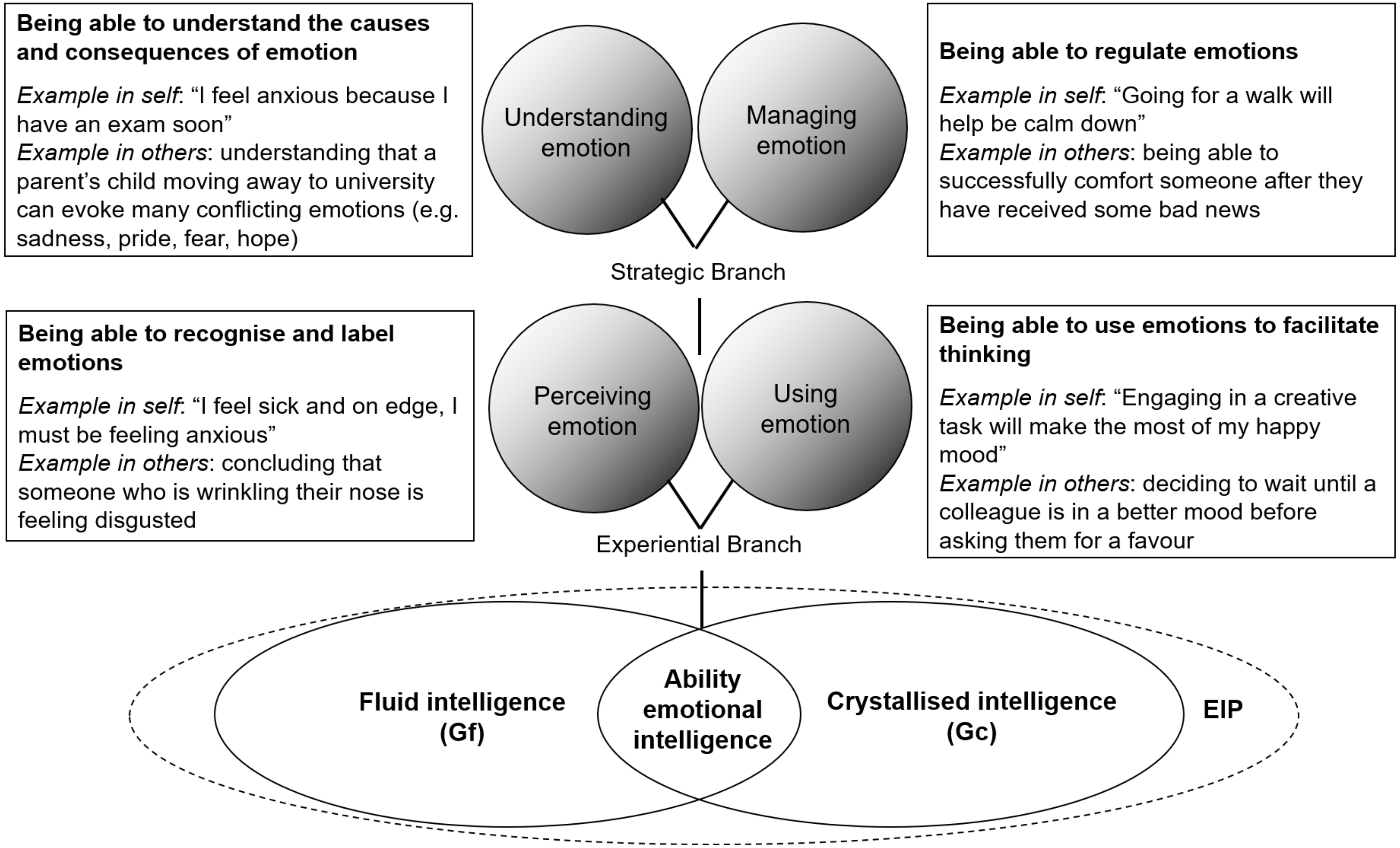
Andrei, Siegling, Aloe, Baldaro, & Petrides, 2016), and cognitive ability (Karim & Shah, 2014). The sections below provide an overview of each EI 'type', and indicate the key challenges currently faced by the AEI and TEI fields, which include establishing a nomological network, and issues concerning measurement. Since the research for the thesis is conducted with 16-18 year olds, attention then turns to the issue of reliably and accurately measuring EI in older adolescents.

2.3.1 AEI: Challenges and controversies

The AEI approach conceives EI as a form of intelligence, where the content domain is emotions, similar to how numbers or words represent the content domains of numerical and verbal abilities (Mayer, Caruso, & Salovey, 2016). The most commonly utilised and accepted model of AEI is that proposed by Mayer and Salovey (1997). Their model proposes four abilities: emotion perception, emotion understanding, using emotion, and emotion management (see **Figure 4** for examples). The first branch, *emotion perception* involves the ability to identify discrete emotions in others and oneself, requiring the individual to accurately attend, detect, and decipher emotional signals (Papadogiannis, Logan, & Sitarenios, 2009), and show self-awareness of one's own physiological and psychological state (Mayer, Caruso, & Salovey, 1999). The second branch refers to *using emotion to facilitate thought*. In contrast to earlier research that viewed emotion and cognition as opposing forces (e.g., Lloyd, 1979), current thinking posits that cognition and emotional processes can interact to enhance thinking, and lead to adaptive behaviour (Fiori & Veseley-Maillefer, 2018). This branch captures the integration of emotions with cognition, whereby individuals skilled at 'using emotion' successfully use emotional

Figure 4

Branch Descriptions and Nomological Network of the Four-Branch Model of Ability Emotional Intelligence (AEI) (Mayer & Salovey, 1997)



information to perform cognitive activities such as problem-solving and decision-making (Mayer & Salovey, 1997). *Understanding emotions* (the third branch) comprises the ability to comprehend the antecedents and consequences of emotions in the self and others, and an understanding of how emotions vary as a function of time and context (Rivers, Brackett, Salovey, & Mayer, 2007). This requires proficiency in being able to predict which emotions will arise from a specific scenario, how someone's emotional state will affect their behaviour, and an understanding of the way that emotions blend together to form complex emotional experiences. The fourth branch (*emotion management*) involves the ability to regulate one's own, and others' emotions effectively and as required/intended for the specific situation. Emotion management is thought to be the most sophisticated and cognitively complex of the four branches, and includes both up-regulation and down-regulation.

Efforts to develop performance-based measurement of EI culminated in the *Mayer-Salovey-Caruso Emotional Intelligence Test* (MSCEIT; Mayer, Salovey, & Caruso, 2002), in which EI is perceived as a general factor organised into the four emotional abilities described above (Mayer & Salovey, 1997). While these abilities converge with each other as distinct yet related skills (Elfenbein & MacCann, 2017), the branches are theorised to possess a hierarchical arrangement (see **Figure 4**). The 'bottom' branches (emotion perception, and using emotions to facilitate thought) are considered a necessary foundation ('experiential' processing) for the 'top' two (emotion understanding and management), which are considered more sophisticated, higher-level ('strategic') cognitive processes (Mayer & Salovey, 1997). The MSCEIT comprises 141 items across eight tasks (two tasks for each branch), for which 'correct' answers can be identified, using either 'expert' scoring (where the answers are agreed by emotion experts) or 'consensus' scoring (based on the proportion of sample that endorsed that same answer), with generally high agreement found between the two methods (.93-.99; Mayer, Salovey, Caruso, & Sitarenios, 2003). The MSCEIT remains the most commonly used AEI measure in empirical research to date (as reported in systematic reviews, e.g., Gutiérrez-Cobo, Cabello, & Fernández-Berrocal, 2016; Laborde, Dosseville, & Allen, 2016; Lea, Davis, Mahoney, & Qualter, 2019).

Historically, EI critics have claimed that AEI does not meet the standards for an intelligence (Roberts, Zeidner, & Matthews, 2001), arguing that there is a general absence of a clear conceptual model of intelligence within which to place EI. However, there have now been several efforts to locate AEI within the structure of intelligence, with factor-analytic studies suggesting that AEI occupies a position in the intelligence hierarchy at the level below *g* (the general factor of intelligence) (MacCann, 2010; MacCann et al., 2014). From a theoretical perspective, AEI should correlate with cognitive ability, but not too highly such that AEI would be rendered redundant (Elfenbein & MacCann, 2017). Furthermore, some argue that we should use a more nuanced approach to conceptualising AEI and intelligence, whereby the magnitude of relations should differ depending on whether the EI branches are related to fluid or crystallized intelligence (e.g., Roberts, Schulze, & MacCann, 2008). Whereas general intelligence (or, 'general cognitive ability') refers to an individual's overall capacity for adaptation through effective information processing (Brody, 2004), contemporary frameworks suggest intelligence has *crystallised* and *fluid* components. According to the highly regarded Cattell-Horn-Carroll theory (Cattell, 1963; Stankov, Boyle, & Cattell, 1995; Sternberg & Kaufman, 1998), fluid intelligence (Gf) comprises 'raw' abilities, including abstract reasoning, concept formation, and novel problem solving, independently of acquired knowledge. In contrast, crystallised intelligence (Gc) includes higher level cognitive skills that rely on acquisition and application of explicit, culturally-based, declarative knowledge. Findings often demonstrate positive but relatively weak associations between AEI and crystallised intelligence (i.e., using acquired knowledge to solve problems) (MacCann, Matthews, Zeidner, & Roberts, 2003; Mayer, Salovey & Caruso, 1999; Roberts et al., 2001). This has particularly been the case for the emotion management and emotion understanding branches of AEI (Farrelly & Austin, 2007; MacCann, 2010; MacCann, Fogarty, Zeidner, & Roberts, 2011). However, a recent meta-analysis (352 effect sizes from 80 studies) examined the relations between the four AEI branches, fluid intelligence (Gf), and crystallised intelligence (Gc) (Olderbak, Semmler, & Doebler, 2018). Findings indicated that, for all branches, the strength of the relationship with Gf and Gc was equivalent (i.e., the magnitude of relationship between AEI and intelligence was not dependent on the intelligence ‘subtype’ examined). However, understanding emotions most strongly correlated with Gf/Gc combined, relative to using emotion to facilitate thought, managing emotions, and perceiving emotion (Olderbak et al., 2018). Taken together, the above findings suggest that while AEI (especially the strategic branches) generally relates to cognitive ability, the four branches of ability EI do not appear differentially related to Gf or Gc. It would appear that AEI relates to intelligence broadly, rather than specifically.

Nevertheless, the *structure* of AEI itself is continuously being reviewed and refined. For example, emotion information processing (EIP) – how individuals (both consciously and automatically) acquire, perceive, encode, pay attention to, retain, and retrieve, emotional information - has been proposed as an important component of both EI and emotion regulation (Fiori & Veseley-Maillefer, 2018). In other words, emotionally intelligent behaviour could be in part be underpinned by differences in EIP, such as the speed of processing emotional information (see **Figure 4**, also Austin, 2005; Matthews et al., 2002). Emotions are an important source of information in our environment (Schwartz, 2012), and, in theory, EI could promote adaptation by enabling more efficient processing of that information. The information-processing approach to EI is small, but growing (Gutiérrez-Cobo et al., 2016; Veseley-Maillefer et al., 2018). Overall, findings indicate that AEI predicts efficient emotion processing more strongly than TEI, alluding to AEI's links with cognitive abilities (Gutiérrez-Cobo et al., 2016; Gutiérrez-Cobo, Cabello, Fernández-Berrocal, 2017). In an attempt to integrate the EI and EIP perspectives, Veseley-Maillefer and colleagues (2018) recently introduced the 'PAT' theoretical framework (EI<u>P</u>, <u>A</u>EI, and <u>T</u>EI) to explain how TEI, AEI, and EIP may interact to predict emotionally intelligent behaviour, and downstream EI-related outcomes.

Specifically, Fiori and colleagues have recently suggested the notion of a fluid, experiential component of AEI, to capture the automatic EIP that occurs independently of acquired knowledge (Fiori & Veseley-Maillefer, 2018). The key issue is that contemporary AEI measurements are less than ideal, and do not provide valid and sufficient coverage of the AEI construct (Olderbak et al., 2018). In theory, scoring highly on AEI measures is supposed to represent proficiency in emotion-related cognitive abilities, encompassing superior EIP, and coverage of AEI's fluid and crystallised components (Fiori & Veseley-Maillefer, 2018; Veseley-Maillefer, Udayar, & Fiori, 2018). This is not the case. For example, the MSCEIT structure has been disputed and contradicted on several occasions (e.g., Fiori & Antonakis, 2011), with some suggesting the addition of two new abilities (*emotion expression ability* and *emotion attention regulation*), and the splitting of emotion management into 'regulating own' and 'regulating others' emotions (Elfenbein, Jang, Sharma, & Sanchez-Burks, 2017; Elfenbein & MacCann, 2017). Furthermore, researchers often suggest that the branch concerning *using emotion to facilitate thought* is problematic, and that models without this branch show improved construct validity and fit MSCEIT data better (e.g., Gardner & Qualter, 2011). Thus, the facilitation branch is often flagged as conceptually redundant (Palmer, Gignac, Manocha, & Stough 2005; Rossen, Kranzler, & Algina, 2008). Some EI researchers argue that facilitating emotion could instead be considered as part of the emotion management branch, since using emotions to accomplish goals can be a form of emotion regulation (Joseph & Newman, 2010; Maul, 2011; Maul, 2012). As a consequence, studies sometimes omit the facilitation branch *a priori* when measuring AEI (e.g., Joseph & Newman, 2010).

The MSCEIT is costly to purchase, and the scoring process lacks transparency, since it is scored off-site by the publisher, Multi-Health Systems Inc. (Keefer, Parker, & Saklofske, 2018). The unorthodox use of consensus scoring or expert scoring is also problematic due to the subjectivity of the emotional experience (Siegling et al., 2015a), and the lack of consideration for context (Fiori, Antonietti, Mikolajczak, Luminet, Hansenne, & Rossier, 2014). Furthermore, the majority of the items of the MSCEIT (and indeed, most AEI instruments) assess performance in *hypothetical* scenarios, which relies on emotion knowledge, rather than the ability to execute adaptive behaviour. Individuals could be adept at thinking and describing how they or a generic person *should* behave in a hypothetical situation, but lack the procedural skill to execute these behaviours themselves in everyday life (Fiori, 2009). The construct validity of the MSCEIT is therefore questionable, since scores might reflect vocabulary size, conformity to social norms, emotional knowledge, stereotypical judgements, or a combination (Petrides, 2011; Siegling et al., 2015a). There is a pressing need for improved AEI assessment tools.

Newer, non-commercial alternative AEI instruments have since been developed, to address the MSCEIT construct validity issues (Fiori & Veseley-Maillefer, 2018). For this, a piecemeal approach is generally taken. Unlike the MSCEIT, some of the more contemporary measures do not often represent all four branches of the four-branch AEI model within the same instrument. This seems a logical approach, as summarised by Fiori and Veseley-Maillefer (2018):

> Knowing that EI is a complex construct, it seems unlikely that “one perfect” measure that would capture all the different components of EI is in the near future. It may be more realistic to aim for “several good” measures of EI, each of them capturing key aspects of this construct with satisfactory reliability and validity (p.41).

Among the new assessments are the Situational Test of Emotion Management (STEM), and the Situational Test of Emotion Understanding (STEU) (MacCann & Roberts, 2008), both of which are freely available. Unlike the MSCEIT, which was empirically keyed, the STEU uses a theoretical scoring system, using Roseman’s (2001) appraisal theory of emotions. To tackle the issue of construct validity, for which the MSCEIT is commonly criticised, the STEM characteristics have been experimentally manipulated to distinguish test effects from construct effects (MacCann & Roberts, 2008). In the STEM, participants select the optimum emotional management strategy to deal with either sadness, anger, or fear, across a diverse range of 44 scenarios. In contrast, the STEU instructs the participant to identify which emotion (e.g., sadness, pride, regret, contempt, frustration, anger, fear) is most likely to be felt in a range of given situations. Despite their relatively recent development, psychometric properties of the STEU and STEM appear convincing so far, with adequate reliabilities of .71 (STEU) and .68 (STEM) (MacCann & Roberts, 2008). As the thesis utilises those newer AEI measures, more information about the STEM and STEU is provided in Chapter 4. Some of the newer measures, particularly those assessing the emotion perception branch, are more dynamic (e.g., Multimodal Emotion Recognition Test [MERT]; Bänziger, Grandjean, & Scherer; 2009; Geneva Emotion Recognition Test [GERT]; Schlegel & Scherer, 2015), whereby participants select the emotion being expressed in video clips. Fortunately, the future regarding AEI assessment is promising, and the field appears to be progressing towards more reliable and valid forms of assessment (Fiori & Veseley-Maillefer, 2018; Keefer et al., 2018).

2.3.2 TEI: Challenges and controversies

Following Goleman's influential book (Goleman, 1995), several attempts were made to develop self-report EI measures (i.e., TEI) alongside the skill-based (i.e., AEI) measures outlined in the above section. In contrast to AEI, which approaches EI as a set of emotional competencies, TEI is an umbrella term for emotional traits and dispositions that underlie emotionally intelligent behaviour (Petrides et al., 2007). TEI is often labelled as 'self-reported' EI, or emotional self-efficacy, since it represents people's *beliefs* about their emotions (Petrides et al., 2016). Unlike the case for AEI, the TEI field is not dominated by a single instrument, and data is derived from multiple tests. While TEI instruments vary widely in their content and, by extension, coverage of the TEI sampling domain, TEI measures share the same measurement method of self-report questionnaires, with responses typically modulated on a Likert scales (e.g., the Trait Emotional Intelligence Questionnaire [TEIQue]; Petrides, 2009; Emotional Quotient Inventory [EQ-i]; Bar-On, 1997; Schutte Emotional Intelligence Scale [SEIS]; Schutte & Malouff, 1998).

One key issue is that TEI measures are sometimes criticized for having an unclear structure. For example, the EQ-i is often considered somewhat vague, having been converted from a well-being inventory to an EI questionnaire (Pérez, Petrides, & Furnham, 2005). In addition, some TEI instruments (e.g., EQ-i Bar-On, 1997; SEIS; Schutte & Malouff, 1998) are restricted in their range and depth of coverage of the TEI domain, and do not sufficiently capture some important aspects of emotional functioning, such as emotion regulation, emotion expression, and self-motivation (Parker, Keefer, & Wood, 2011; Pérez et al., 2005; Petrides, 2009; Schutte & Malouff, 1998). The sampling domain of TEI most commonly used in contemporary studies was derived by Petrides and Furnham (2001), via a content analysis of early models of EI and related constructs, with the aim of providing a general platform to interpret subjective emotional self-efficacy (**Table 1**). The TEIQue family of measures (e.g., TEIQue, TEIQue-Short Form [TEIQue-SF], TEIQue-Adolescent Full Form [AFF]) (Petrides, 2009) are some of the few TEI tools that have been developed according to a clear theoretical framework (Siegling et al., 2015a; Siegling, Veseley, Petrides, & Saklofske, 2015b). The TEIQue is not only the most commonly used measure when assessing TEI (e.g., Lea et al., 2019), but, compared to other TEI instruments, has been found to be the best predictor of multiple psychological criteria in adults (Gardner & Qualter, 2010). TEIQue measures generally show excellent reliability which usually exceeds .80 (e.g., Cooper & Petrides, 2010; Petrides, 2009), a robust factor structure that retains its validity even in the brief versions (Cooper & Petrides, 2010), and good predictive validity (Petrides, 2011). Thus, the programme of research will use the TEIQue to measure TEI in all three empirical studies, and the remainder of the theoretical and empirical discussions of TEI in this chapter will refer to the TEIQue as the frame of reference.

Table 1

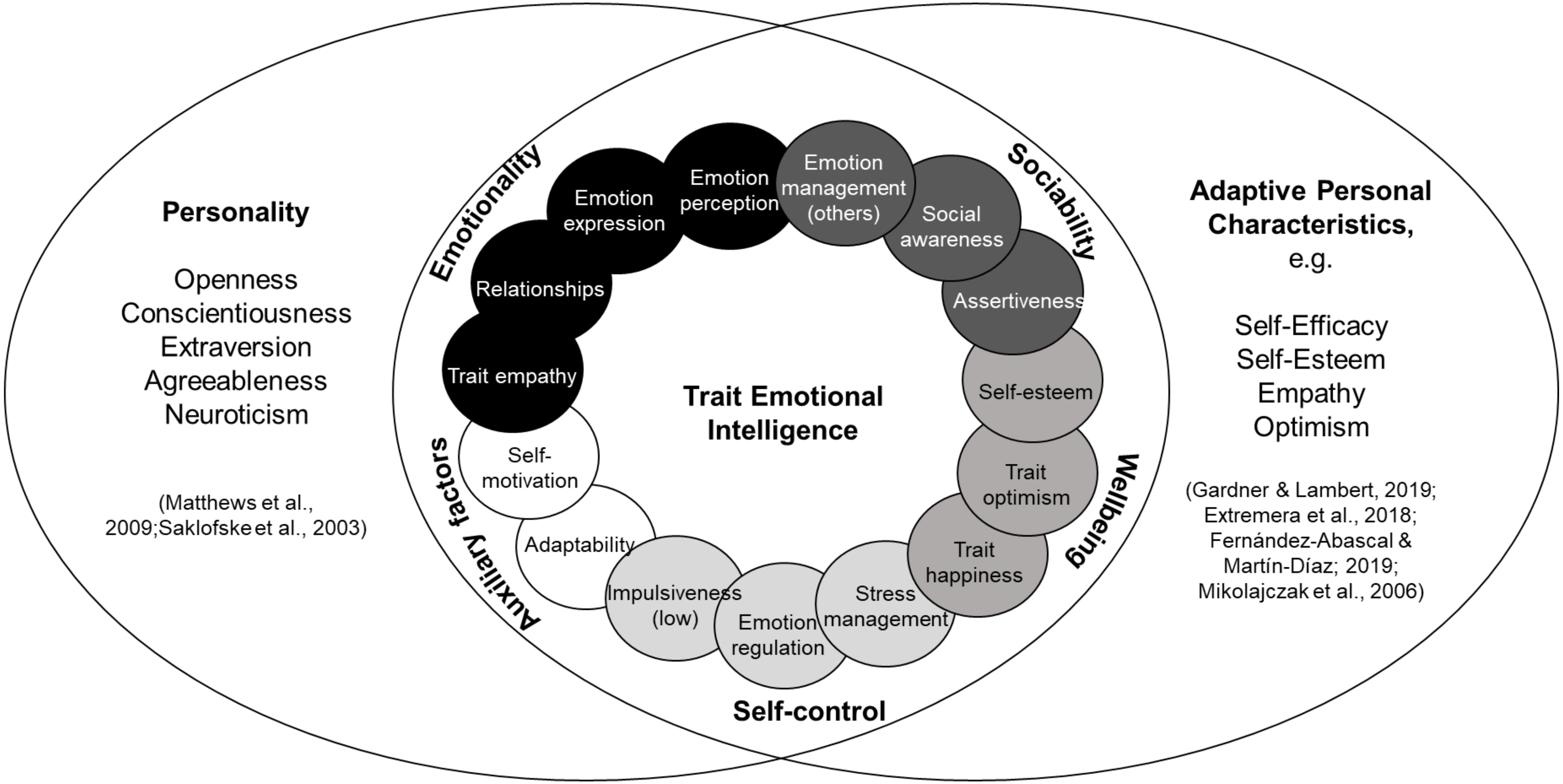
The Sampling Domain of Trait Emotional Intelligence (Petrides & Furnham, 2001)

Facets	High scorers perceive themselves as…
Adaptability	…flexible and willing to adapt to new conditions
Assertiveness	…forthright, frank, and willing to stand up for their rights
Emotion perception (self and others)	…clear about their own and other people’s feelings
Emotion expression	…capable of communicating their feelings to others
Emotion management (others)	…capable of influencing other people’s feelings
Emotion regulation	…capable of controlling their emotions
Impulsiveness (low)	…reflective and less likely to give in to their urges
Relationships	…capable of having fulfilling personal relationships
Self-esteem	…successful and self-confident
Self-motivation	…driven and unlikely to give up in the face of adversity
Social awareness	…accomplished networkers with excellent social skills
Stress management	…capable of withstanding pressure and regulating stress
Trait empathy	…capable of taking someone else’s perspective
Trait happiness	…cheerful and satisfied with their lives
Trait optimism	…confident and likely to ‘look on the bright side of life’

But what exactly is TEI? There has been a crucial need to establish TEI beyond “a grab-bag of desirable personal characteristics” such as agreeableness, optimism, empathy, and assertiveness (Zeidner, Matthews, & Roberts, 2006, p.102). **Figure 5** illustrates the TEI sampling domain, and its nomological network. Expectedly, TEI shows little or no relationship with cognitive ability in empirical studies (Newsome, Day & Cantano, 2000; Derksen, Kramer, & Katzko, 2002). However, TEI scales tend to correlate substantially with several of the Big Five personality traits, such as those of the Five Factor Model (FFM; McCrae & Costa, 2008). Specifically, global TEI typically shows a strong positive relationship with extraversion, a strong negative relationship with neuroticism/emotion instability, and

Figure 5

Diagram of the Nomological Network of Trait Emotional Intelligence (TEI), Based on the Trait Emotional Intelligence Questionnaire (TEIQue) Sampling Domain (Petrides & Furnham, 2001)



small positive correlations with openness, agreeableness, and conscientiousness, as demonstrated by meta-analytic investigations (e.g., van der Linden, Pekaar, Bakker, Schermer, Vernon, Dunkel, & Petrides, 2017; van Rooy & Viswesvaran, 2004). As such, throughout EI's history, there have been concerns that the associations between EI and adaptive outcomes simply reflect the overlap between EI and personality traits (Zeidner et al., 2012b).

To help establish the discriminant validity of TEI, there have been several attempts to locate TEI in personality space. Such endeavours have indicated that TEI is both distinct (i.e., it can be isolated in personality space), *and* compound (i.e., it correlates with several higher-order personality dimensions), concluding that TEI is located at the lower levels of personality hierarchies (De Raad, 2005; Petrides & Furnham, 2001; Petrides et al., 2016). Further factor analyses have demonstrated that TEI facets define a distinct oblique factor in the spaces of the Giant Three and Big Five (Petrides et al., 2007). Importantly, the literature now suggests that TEI typically shows incremental validity over personality traits in criteria pertaining to many different areas of functioning, including physical and mental health, academic achievement, and behavioural criteria (Andrei et al., 2016; Siegling et al., 2015b; Siegling, Veseley, Saklofske, Frederickson, & Petrides, 2017). However, controlling for personality helps produce a 'clean' assessment as possible when establishing the role of TEI (Davis, 2018b). It is wise to still test for the incremental effects of TEI in situations where the role of TEI is still relatively unknown (e.g., attentional selection; Davis, 2018b; stress reactivity; Mikolajczak, Roy, Luminet, Fillee, & Timary, 2007). In other words, while TEI may show incremental validity beyond personality in predicting adaptive criteria in adults in questionnaire-based studies (Andrei et al., 2016), personality or other trait factors may be a stronger predictor of those criteria in different samples (e.g., adolescents), or in different contexts (e.g., in times of acute stress).

It is currently unclear which aspects of TEI lead to positive effects (i.e., which facets), and in which circumstances (i.e., under stressful conditions). A major problem occurs when TEI overlaps theoretically with the constructs being measured (e.g., subjective well-being [SWB]). Psychological well-being comprises a component of TEI (e.g., happiness is part of the TEI sampling domain, and well-being is a subscale of the TEIQue, see **Figure 5**), so it would be illogical if TEI did *not* relate to well-being. Indeed, "well-being may correlate with questionnaire measures of EI [TEI] precisely because both types of measure reflect how positive the person's self-opinions are", and self-esteem correlates with both (Zeidner, Matthews, & Roberts, 2012, p.20). Empirically, TEI scores often correlate very highly with SWB, with r values often exceeding .70 (e.g., r = .70 with happiness; Petrides & Furnham, 2003), and even stronger correlations for the TEI well-being subscale in isolation (e.g., r = .76 with life satisfaction; Freudenthaler, Neubauer, Gabler, Scherl, & Rindermann, 2008). Though rarely carried out, subscale analyses (i.e., repeating analyses with TEI subscale scores) may provide more meaningful interpretations than working with composite TEI scores alone, by elucidating which elements of emotional self-efficacy are most useful in different contexts (Downey, Johnston, Hansen, Birney, & Stough, 2010; Zeidner et al., 2012b). The present research conducts exploratory subscale analyses to address that issue.

2.3.3 The need for a dual approach to EI, with age-appropriate measures

Generally, most EI researchers agree that TEI and AEI represent different constructs, and explain different aspects of emotionally intelligent behaviour (Fernández-Berrocal & Extremera, 2006), because, ultimately, emotional skill (i.e., AEI) indicates maximum performance (i.e., what an individual *could* do given optimal circumstances) but does not necessarily represent what we *tend to* do on an everyday basis, which is captured by TEI (e.g., Gohm, Corser, & Dalsky, 2005). However, few studies examine the contribution of both ‘types’ of EI to life outcomes. Compared to TEI, a lack of AEI studies has been indicated by systematic reviews of EI and stress reactivity (Lea et al., 2019), performance on cognitive tasks (Gutiérrez-Cobo et al., 2016), and psychological maladjustment in adolescence (Resurrección et al., 2014). However, despite the availability and ‘acceptance’ of valid TEI measures, they are especially susceptible to the more general issues associated with non-cognitive self-report measures, namely the tendency of individuals to respond in a socially desirable manner (i.e., to over-report positive behaviour and under-report negative behaviour) (e.g., Grubb & McDaniel, 2007; Tett, Freund, Christiansen, Fox, & Coaster, 2012). In one experimental study by Day and Carroll (2007), participants completed a TEI measure (EQ-i) and an AEI measure (MSCEIT) measures in two conditions (a job application condition versus a control condition). The EQ-i was much more susceptible to faking than the MSCEIT (i.e., scores between the job and control conditions were significantly more disparate for EQ-i than for the MSCEIT). The issue of socially desirable responding becomes especially pertinent when one considers that the majority of TEI studies examine the relationship between TEI (i.e., self-reported EI) and some other self-reported outcome (e.g., life stress; Extremera et al., 2007). When both predictors and criterion measures are self-reported, there is the risk of “contamination”, where findings may have arisen from shared measurement error (i.e., positive self-evaluations), rather than true associations (Keefer et al., 2018). Thus, focussing on TEI may not provide us with the full picture of EI’s mechanisms of action. To an extent, AEI helps to circumvent those self-report issues through maximum performance testing. It is therefore important to consider TEI findings *alongside* those for

AEI. Rather than viewing AEI and TEI as competing, mutually exclusive conceptualisations (Mayer et al., 2008), this work adopts the perspective that they represent *complementary* approaches to the study of EI, and both have the potential to offer valuable insight into adaptational behaviours.

The issues regarding the conceptualisation and measurement of EI is confounded further by the distinct lack of age-appropriate EI measures. Few EI measures are designed for populations of specific ages, and even fewer for the later years of adolescence (16-18 years). Older adolescents are sometimes described as a 'forgotten group', often caught in the gap between adolescence and adulthood with respect to research, measurement, and clinical practice (Kennedy, 2010). To ensure construct validity, the developmental literature suggests that, ideally, different instruments are needed to assess emotion-related constructs (such as EI) at different ages (Denham, Wyatt, Bassett, Echeverria, & Knox, 2009). According to social constructionist and functionalist perspectives, subjective emotional experience is highly dependent upon the social context (e.g., relationships with family and peers), and social experience (e.g., experience at solving emotion-related problems), both of which change drastically throughout development (Saarni, 1999). Broadly speaking, emotional skills *should* increase progressively with greater maturity and further life experience (Saarni, 1999).

In terms of EI specifically, relatively little is known about its development (especially AEI) with respect to age and experience. However, personality research has found evidence of "maturity" during the years of emerging adulthood, indexed via increases in conscientiousness and emotional stability (Roberts, Walton, & Viechtbauer, 2006). Between late adolescence and emerging adulthood (ages 17-27 years), one study found that the most dramatic changes were a decrease in constructs related to negative emotionality (e.g., aggression), and an increase in scores for traits related to constraint (e.g., self-control) (Donnellan, Conger, & Burzette, 2007). A gradual maturational process is also often assumed for TEI, with Petrides et al. (2007, p. 158) noting, "people become less emotional and better socialised". While there are relatively few studies that have carried out comprehensive longitudinal testing, the limited evidence available suggests that TEI is relatively malleable during adolescence, but that it becomes more stable with age (Keefer, Holden, & Parker, 2013; Keefer, Parker, Saklofske, Wood, Eastabrook, & Taylor, 2005). However, TEI development may be non-linear (Esnaola et al., 2017). In the most comprehensive longitudinal study to date, Keefer et al. (2013) monitored TEI changes (using the Emotional Quotient Inventory: Young Version Short form; Bar-On & Parker, 2000) in a sample of 10-18-year-olds over a six-year period, and found varying decreasing, increasing, and stable patterns depending on age and the different specific facets (i.e., development was often non-linear). For example, for the intrapersonal scale, there was an initial decrease between the 10-11 and 12-13 age ranges, followed by relatively little change until the age of 17, whereas adaptability scores tended to decrease until ages 14-15, and then increase at ages 16-17 (Keefer et al., 2013). Later work has also emphasised that over the course of adolescence, certain trait EI-related competences, notably those relating to interpersonal traits and adaptability, are especially malleable and sensitive to improvement (Dave, Keefer, Snetsinger, Holden, & Parker, 2019).

In general, we do not know how and when AEI changes as a function of age and experience, other than that overall AEI scores tend to increase with age (Davis & Humphrey, 2012a; Peters, Kranzler, & Rossen, 2009), with a significant increase between adolescents and adults (Cabello, Sorrell, Fernández-Pinto, Extremera, & Pablo Fernández-Berrocal, 2016). However, longer term patterns of change in the construct are relatively unexplored. Considering that EI not only demonstrates gradual maturation, but that non-linear development appears to occur over adolescence (e.g., Keefer et al., 2013), accounting for developmental stage would appear critical when considering how to assess EI (or indeed, any emotion-related construct) in children and adolescents (Zeman, Klimes-Dougan, Cassano, & Adrian, 2007).

Whilst adolescent versions of EI measures *do* exist, they are not perfect. By far the most commonly utilised TEI measures for adolescents include the EQ-i:YV (Bar-On & Parker, 2000) and the adolescent versions of the TEIQue (Petrides, 2009). In the case of the TEIQue, adolescents in the ages of 16-18 years can be administered *either* the adult version of scales (TEIQue; Petrides, 2009) *or* the adolescent version, designed for ages 13-17 years (e.g., TEIQue-AFF; Petrides, 2009; TEIQue-Adolescent Short Form [TEIQue-ASF; Petrides, Sangareau, Furnham, & Frederickson, 2006). While the TEIQue-Children Form (TEIQue-CF; Mavroveli, Petrides, Shove, & Whitehead, 2008) is based on a sampling domain specifically developed for children, the sampling domain for the adolescent forms of the TEIQue is analogous to that designed for adults (Petrides, 2009). Differences between adult and adolescent TEI measures are generally only related to readability. Adolescent forms of TEI measures are typically generated by simplifying the wording and/or the syntactic complexity of adult measures, and are rarely generated specifically for the adolescent population. For example, the TEIQue item "I often find it difficult to stand up for my rights" is changed to "I find it hard to stand up for my rights" in the adolescent version of the scale (Petrides, 2009). Although most validation work has been conducted with the adult TEIQue, psychometric properties of the adolescent version (TEIQue-ASF) do appear convincing so far (Davis &

Humphrey, 2014; Siegling et al., 2015b), and the TEIQue-ASF has been widely used (e.g., Ferrando et al. 2010; Mavroveli, Petrides, Rieffe, & Bakker, 2007).

With respect to AEI, few youth versions are available, but the internal consistencies are reasonable for the few that have been developed, such as the MSCEIT-Youth Version (MSCEIT-YV; Mayer, Salovey, & Caruso, 2014), and the Situational Test of Emotional Management-Youth Version for young adolescents (STEM-Y; MacCann, Wang, Matthews, & Roberts, 2010). As with the TEI measures, the adolescent and adult versions differ in terms of readability, but in some cases the item content is changed. For example, the scenarios utilised in the STEM-Y also included emotional situations related to school life, unlike the adult version of the STEM (MacCann & Roberts, 2008). While these often show psychometric shortcomings compared to the adult versions of the scales (Davis & Wigelsworth, 2017), they often still meet the minimum levels of reliability and validity required for research use.

Some developmental psychologists suggest that levels of self-awareness and self-insight of adolescents older than 16 years is on par with that of adults, meaning that their answers *should* be more accurate and reliable than those of children (Denham et al., 2009; Wigelsworth, Humphrey, Kalambouka, & Lendrum, 2010). While this may be true, evidence indicates older adolescents often disengage with materials when the language, examples, and values used, are deemed inappropriate for their developmental stage (Yeager et al., 2017). While adolescent forms of both TEI and AEI instruments are designed for use with a wide age range (e.g., MSCEIT-YV for 10-18 years; Mayer et al., 2014; STEM-Y for 11-15 years; MacCann et al., 2010; EQ-i:YV: 7-18 years), they appear inclined towards, and to be validated more with, younger adolescents (e.g., Rivers, Brackett, Reyes, Mayer, Caruso, &

Salovey, 2012). For example, Pfeiffer (2001) estimates the EQ-i:YV is geared to a reading level of 9-10 years, and the STEM-Y item 6 asks adolescents to imagine they are the secretary for their school chess club. There is a potential risk that the content of EI measures may not be age-appropriate for participants aged 16-18, risking them feeling patronised, and subsequently, resulting in disengagement (Denham et al., 2009).

Overall, there seems to be a disparity between the developmental literature – which suggests age-appropriate measures of EI may be needed (Denham et al., 2009) – and EI research, which uses either the adult form, a syntactically simplified version of the adult form, or a child form. The field would benefit greatly from the further development of EI measures (particularly AEI) specifically for older adolescents (i.e., between the ages of 16 and 18 years), with developmentally appropriate wording, relevant scenarios/situations/context, and sampling domains (e.g., Zeman et al., 2007). However, in the meantime, further testing of existing AEI measures is required to establish their psychometric properties with adolescent samples. Although not a primary aim, and beyond the scope of the research, studies will also serve to validate several EI measures within the 16-18 year old population. Taken together, the evidence discussed above, alongside recommendations made by critical reviews (e.g., O'Connor, Hill, Kaya, & Martin, 2019), suggests the TEIQue, STEM, and STEU families of measures as the most appropriate tools for use in the programme of research.

2.4 Towards a process-oriented approach to EI and stress

Earlier discussion emphasised that, despite issues concerning measurement and operationalisation, EI appears an especially useful individual-level resource for young people under challenging circumstances, where the need to regulate emotions is especially salient

(Austin, Saklofske, & Mastoras, 2010; Davis & Humphrey, 2012a; 2012b; Extremera et al., 2007; Keefer et al., 2018). Within a resilience framework, there is a body of work examining the utility of EI as a protective marker that operates within stress regulation pathways, leading to positive life outcomes for young people (e.g., Ciarrochi et al., 2002; Davis & Humphrey, 2012a; 2012b; 2014; Mikolajczak et al., 2006). However, most studies historically have employed a cross-sectional design, whereby participants' standing on two or more self-reported variables (e.g., TEI; perceived life stress) are measured, and correlational analyses are subsequently used to test for a significant relationship. As Martins et al. (2010, p.562) noted a decade ago, cross-sectional research on EI and health "has already reached sufficiency and stability". Furthermore, such work does not inform us of the processes through which EI influences stress responding in context (i.e., when the individual is acutely stressed).

By using an approach designed to investigate the *processes* involved (i.e., the processes underlying EI), we can begin to understand how and when EI could buffer the effects of stress. Our understanding of how EI works in specific situations (i.e., its mechanisms of action) is still very limited, since studies do not often acknowledge contextual factors (e.g., emotional state of the participant) (Veseley-Maillefer et al., 2018). To test the hypothesis that EI acts as a stress buffer for young people, research needs to examine which mechanisms relate to EI under conditions of acute stress. As will be covered by Chapter 3, there is progress to be made in this area by acknowledging the links between EI and emotion regulation (ER) strategies - processes through which individuals can dampen, intensify, or maintain their emotional/stress response (Peña-Sarrionandia et al., 2015).

The present programme of research takes a process-oriented approach in the sense that, rather than focussing exclusively on whether EI leads to positive life outcomes *per se* (i.e., 'what' EI does), its studies examine some of the mechanisms (in the form of ER processes) that may underlie the relationships between EI and those positive outcomes, and under which conditions (e.g., 'how' and 'when' EI works). Broadly, this could be conceptualised as moderated mediation, whereby EI (i.e., the predictor) could dampen the stress response (i.e., the outcome), via adaptive ER processes (i.e., mediating variables), with these effects contingent on the level of stress (i.e., the moderator, such as experimental condition). However, EI may benefit adolescent stress regulation in several ways, and potentially operate through several different processes and pathways. For example, EI may buffer (i.e., moderate) the stress response *directly* (i.e., higher levels of EI correspond with less stress, as indicated by biomarkers and/or psychological markers). EI may also moderate the effects of stress *indirectly* (i.e., by promoting effective ER during stressful situations, which subsequently reduces the impact of the stress). Moreover, the relationships between EI and outcomes in stressful situations (e.g., stress reactivity) may be mediated by specific ER processes, and furthermore, may depend on whether EI is conceptualised as a trait or an ability, and/or differ according to the nature of the stress encountered. These perspectives will be explored in the three empirical studies that comprise this programme of research (Chapters 4-6). Chapter 3 critically evaluates the current status of the evidence base regarding EI and acute stress, highlighting the potential ER processes that might be involved, and the gaps that need to be addressed.

CHAPTER THREE

EMOTIONAL INTELLIGENCE: A POTENTIAL STRESS BUFFER?

3.1 Chapter overview

This chapter critically evaluates the notion that EI may act as a 'stress buffer'. The chapter begins by reviewing the key literature linking EI to stress-related life outcomes, with particular attention paid to findings relevant to adolescents. Understanding the processes through which EI operates is important, but currently under-researched. To organise the evidence concerning EI and various conscious and automatic ER processes, a focussed integration of the EI and emotion regulation (ER) literature, follows. Culmination of work to date indicates a need to study EI and stress regulation 'in action', in both controlled (experimental) and applied contexts (social media), within older adolescent populations.

3.2 EI and stress outcomes

According to the Transactional Model of Stress, stress occurs when the demands required to respond appropriately to a situation/stimulus are perceived by an individual as exceeding their capabilities (Lazarus & Folkman, 1984). These events are referred to as 'stressors', and are typically appraised as negative, unpredictable, and threatening, by the individual (Liu & Vickers, 2015). A variety of everyday stressors can affect young people, including socially evaluative situations, were one feels negatively judged by others (e.g., peer pressure, interviews/presentations; Rudolph & Conley, 2005; Sumter, Bokhurst, Miers, Pelt, & Westenberg, 2010), family stressors, such as interparental conflict (Chappel, Suldo, & Ogg, 2014), and educational factors (e.g., examination stress; Dewald, Meijer, Oort, Kerkhof, &

Bögels, 2014). More recently, evidence suggests that social media poses a new but powerful stressor for young people (Beyens, Frison, & Eggermont,, 2016; O'Reilly, Dogra, Whiteman, Hughes, Eruyar, & Reilly, 2018; van der Schuur, Baumgartner, & Sumter, 2019; Weinstein & Selman, 2016). However, the above stressors are generally considered 'normative' and clearly do not always have negative effects on mental health or well-being (Luthar et al., 2006; Wright et al., 2013). As alluded to in Chapter 2, testing for EI as a protective factor (i.e., a moderator) within a resilience framework offers the opportunity to investigate whether EI buffers the effects of those acute stressors for young people (e.g., McMahon et al., 2003).

Unsurprisingly, stress management is central to most models of trait (TEI) and ability EI (AEI), and features in their measurement. For example, stress management is a facet of the Trait Emotional Intelligence Questionnaire (TEIQue; Petrides, 2009), and many scenarios of the Situational Test of Management (STEM) assess one's ability to cope with stress (MacCann & Roberts, 2008). Indeed, the stress management dimension of TEI in particular undergoes significant development during adolescence (Esnaola et al., 2017). A hypothesised role for EI as a 'stress buffer' is therefore emerging from the literature: EI could potentially operate within risk trajectories to protect the individual from the effects of stress (Mikolajczak et al., 2009a Mérida-López & Extremera, 2017), and, thus, lead to benefits in a number of life domains. Furthermore, by taking a process-oriented approach, we can investigate not only 'if', but 'how' and 'when' EI contributes to stress regulation (Peña-Sarrionandia et al., 2015).

A substantial amount of cross-sectional research has already linked EI with adaptive stress-related life outcomes. Evidence has identified associations between EI and lower levels of general perceived life stress (i.e., how an individual feels about the general stressfulness of their life; Extremera et al., 2007), and less occupational stress and burnout (i.e., the perceived stressfulness of an individual's job and one's ability to cope at work; Mérida-López & Extremera, 2017). Furthermore, both TEI and AEI appear to help students cope with stress in educational settings. For example, students with higher EI feel less stressed during examination periods (i.e., an acutely stressful situation; Austin et al., 2010). EI also seems to provide a protective function in educational settings over the long term, for example by reducing the risk of developing mental health issues throughout academic study (Perera & DiGiacomo, 2013). Periods of change can be particularly stressful for young people, such as the transition from primary to secondary school (Anderson, Jacobs, Schramm, & Splittberger, 2000), and it is thought that EI may enable young people to cope more effectively with those stressful transitions (Jordan, McRorie, & Ewing, 2010; Qualter et al., 2007). While those studies demonstrate that EI is associated with positive post-transition effects for academic achievement, feelings of self-worth, school attendance, and behaviour – rather than stress specifically – results still suggest that high or moderate levels of EI generally bodes well for young people undergoing stressful transition periods (Qualter et al., 2007; Jordan et al., 2010). As alluded to earlier, late adolescence is an important transition period in which many stressors are encountered, though EI evidence is more limited in this regard. In general, there is a strong evidence base suggesting EI is *linked* to less stress (or more positive outcomes in stressful situations), but there is a clear lack of research elucidating the *precise* role EI plays.

One way that EI could lead to adaptation is via a compensation effect in the presence of other risk factors. EI may indirectly moderate positive outcomes by 'compensating' for deficits in other abilities (e.g., cognitive ability), when the demands of a situation outweigh an individual's other resources (Andrei, Mancini, Baldaro, Trombini, & Agnoli, 2014). That finding is especially prominent within the education literature. While cognitive ability and personality may explain more variance in academic success than EI alone (MacCann et al., 2020), TEI may be a key predictor of academic achievement in specific groups, such as students with low IQ (see Mavroveli & Sanchez-Ruiz, 2011). For instance, whilst low cognitive ability could negatively impact the grade achieved for an assignment, the positive components/facets that constitute TEI might play a role in improving that outcome. Low impulsiveness may help the individual focus on completion of the task, or perceived social competence may empower them to seek help with the assignment. Evidence reflects this: TEI acts as an important moderator of the cognitive ability-achievement relationship, enabling students to attain higher grades by drawing upon emotion-related resources (Ferrando et al., 2010; Fiori, 2015; Perera & DiGiacombo, 2013). In contrast, evidence for the effect of *AEI* on academic performance is mixed. While AEI often shows no links with academic performance (O'Connor & Little, 2003; Rode, Mooney Arthaud-Day, Near, Baldwin, Rubin, & Bommer, 2007), a 5-year longitudinal study revealed that adolescents' AEI scores at the start of high school (*M* age = 11 years 2 months) moderated the effect of cognitive ability on their performance at the end of high school (*M* age = 15 years 10 months) (Qualter, Gardner, Pope, Hutchinson, & Whitely, 2012) supporting the notion of AEI as a compensator for low IQ (Fiori, 2015).

Evidence from the social and emotional learning (SEL) and EI training literature echo the idea that EI may be beneficial for certain individuals. For example, one study demonstrated that the *Promoting Alternative Thinking Strategies* (PATHS; Greenberg, Kusché, & Riggs, 2004) programme (which aims to 'train' EI) is only effective in reducing externalising disorders in *high-risk* children (i.e., those with emotional and behavioural issues at baseline) (Malti, Ribeaud, & Eisner, 2011). In addition, further evidence indicates that EI may be most effective for individuals with low intellectual ability (Fiori, 2015; Mavroveli & Sanchez-Ruiz, 2011), or for vulnerable individuals with deficits in aspects in emotional functioning (e.g., autism spectrum disorder; Pope & Dacre Pool, 2018). Furthermore, for neurotypical, well-adjusted individuals that already possess levels of high EI, additional training does not always appear useful (Davis & Nichols, 2016; Qualter et al., 2007). This poses a serious issue with the “one size fits all” approach typically employed in training interventions. Indeed, there are also growing concerns among a number of EI researchers that high EI may not always be advantageous, and that the relationship between EI and positive life outcomes may not be as linear and direct as implied previously. As discussed by both Davis and Nichols (2016), and Qualter, Whiteley, Hutchinson, and Pope (2007), there could be an optimum level of EI before effects plateau (or even become negative). An optimal ‘window’ of positive skill is seen for similar constructs: very high levels of self-esteem can result in over-confidence, dejection, and even negative behaviours, such as aggression (Baumeister, Campbell, Krueger, & Vohs, 2003), feeding into a wider paradigm shift known colloquially as the ‘too-much-of-a-good-thing’ movement (Pierce & Aguinis, 2013). Future research must pay more attention to the processes involved. It is only by understanding how, and in which contexts, EI may buffer stress that we can start to address the important questions regarding the adaptive value of EI.

The evidence outlined in this chapter thus far suggests that EI is often perceived as a protective, helpful, individual-level resource for navigating the stressors that permeate adolescence. However, using an ER perspective is crucial in aiding the mechanisms underlying the relationship between acute stress (i.e., an adverse experience) and adaptive outcomes (e.g., mental health, well-being, academic success).

3.3 EI and stress regulation processes

There is a growing and diverse body of research examining EI as a moderator of the relationship between adversity and outcomes from multiple life domains. For example, TEI moderates the relationship between childhood abuse and suicidal ideation and attempts (Cha & Nock, 2009), and the relationship between depression and somatic complaints in girls (Mavroveli et al., 2007). Other studies have identified that TEI and AEI moderate effects differently. In a large study (*n* = 748 adolescents) by Davis and Humphrey (2012), TEI lessened the effect of family dysfunction on externalising symptomology, whereas very high AEI *strengthened* the effect of socioeconomic status on depression. Furthermore, Ciarrochi et al. (2002) demonstrated that adolescents scoring higher on TEI experienced less stress (indexed by daily hassles and suicidal ideation), whereas high AEI was associated with *more* daily stress. Whilst not often examining stress 'in action' (i.e., situational stress), such work represents the start of process-oriented investigations into the processes of EI. As alluded to in Chapter 3, rather than exclusively examining whether EI leads to positive life outcomes using questionnaire-based studies, an examination of the *mechanisms* (e.g., ER processes) that may help EI directly and indirectly buffer acute stress, and under which conditions, needs to be conducted to progress the field.

When individuals are faced with a stressor (or even begin to anticipate one), the 'fight or flight' response needs to be activated, catalysing a cascade of endocrine (e.g., cortisol), autonomic nervous system (ANS) (e.g., increased heart rate), psychological (e.g., negative affect), and behavioural responses (e.g., moving away from the stressor) (McEwen, 2006). It is important that an individual's fight or flight response is proportionate to the level of threat encountered, and is sufficiently regulated (i.e., controlled). Indeed, dysregulated stress responding is associated with a diverse range of adverse somatic and psychological outcomes, such as hypertension (Matthews et al., 2004), and depression (Burke, Davis, Otte, & Mohr, 2005). In order for an individual to successfully operate the 'fight or flight' response, they need to regulate their emotions, which can involve a number of strategies. Such ER strategies range from "explicit, conscious, effortful, and controlled regulation (e.g., explicit coping strategies), to implicit, unconscious, effortless, and automatic regulation" (p.2, Gross, 2013). Here, *automatic* processing refers to fast, involuntary cognitive processing that does not require much effort, and occurs outside conscious awareness (e.g., eye movements towards/away from stimuli), whereas *conscious* processes are effortful, more controlled, and explicit (e.g., coping strategies) (Fiori, 2009). In simple terms, EI attempts to understand *who* shows adaptive emotional functioning (i.e., outcome-oriented), and ER attempts to understand *how* individuals do so (i.e., process-oriented) (Peña-Sarrionandia et al., 2015). As suggested by Peña-Sarrionandia et al. (2015), conducting EI research that is more process-oriented (e.g., assessing how EI relates to ER processes under stressful conditions; Mikolajczak, et al., 2008), will help characterise some of the mechanisms that might underpin the advantageous nature of EI. Evidence suggests that, when stressed, adolescents are likely to invoke multiple strategies to manage their emotions, in the hope that one will be successful (Lennarz, Hollenstein, Lichtwarck-Aschoff, Kuntsche, & Granic, 2018). Success of ER strategies is context-dependent; for example, cognitive reappraisal is often an ineffective ER strategy when experiencing emotions of very high intensity (Sheppes, Scheibe, Suri, & Gross, 2011). EI may help adolescents to successfully select and implement the most effective ER strategies for the challenge at hand.

Going forward, exploring the underlying processes of EI, and its stress-buffering effects, could benefit substantially from acknowledging the vast body of ER literature (Peña-Sarrionandia, et al., 2015). Although the EI and ER research traditions have developed in parallel, ER was a focus for research long before the EI term was coined (e.g., Campos, Campos, & Barrett, 1989). ER - an important component of the nomological network of both TEI and AEI - refers to the heterogeneous set of processes through which an individual can dampen, intensify, or maintain their emotion(s) (Gross & Thompson, 2007). Successful ER is central to healthy psychosocial functioning (Gross & Thomson, 2007). In contrast to EI research, which focusses on individual differences in emotional functioning, ER research aims to understand "the processes by which individuals modify the trajectory of one of more component(s) of an emotional response", via alterations in their duration, intensity or quality (Peña-Sarrionandia et al., 2015, p.1).

In 1998, James Gross put forward a general process model of ER which largely shaped the ER field (Gross, 1998a; Gross & Thompson, 1998b), and is still highly regarded two decades later (e.g., Chapman, 2015). Gross' pioneering ER framework has been subsequently applied by emotion researchers across a number of disciplines including occupational (e.g., Grandey, 2000), developmental (e.g., John & Gross, 2004), and clinical psychology (e.g., Werner & Gross, 2010). ER handles "demands that are appraised taxing or exceeding the resources of the person'' (Lazarus & Folkman 1984, p. 141). However, because ER and stress regulation considerably overlap developmentally, conceptually, and physiologically (Wang & Saudino, 2011), Gross' ER framework is often employed to explore how individuals cope with *stressful* experiences (e.g., Moriya & Takahasji, 2013; Scheibe & Zacher, 2013; Troy & Mauss, 2011). The model depicts ER as multi-staged, comprising of five 'families' of ER processes, which are theorized to occur approximately in sequence across the emotion generation trajectory (Gross, 1989a; Gross & Thompson, 1998b) (see **Table 2** for description and examples). Gross also described higher order distinctions between the ER process 'families'. The first four ER families (situation selection, situation modification, attentional deployment, cognitive change) refer to antecedent-focussed processes, which occur *before* a 'full-blown' emotional response has been generated, whereas, in contrast, the last ER family (response modulation) is response focussed, occurring *after* an emotion has been elicited (Gross, 1998a). Gross has since noted that the four-stage model of ER is likely an oversimplification, since ER is more dynamic (i.e., a cyclic or spiral structure is possible, where the emotional response elicited can influence subsequent situation selection), and multiple emotions can be regulated at any one time (Gross, 2015). Thus, while Gross' model may seem to oversimplify the complex process of ER, it nevertheless provides a useful lens through which to consider how EI might influence the stress response.

EI might reduce vulnerability to the pathogenic effects of stress through deployment of adaptive ER strategies and mechanisms (Keefer et al., 2009). However, the role of EI and ER processes can be investigated from multiple perspectives, and at multiple points along the stress response trajectory. It is also useful to conceptualise ER in terms of conscious or automatic processes in the context of EI (Fiori, 2009). While the traditional EI model assumed and measured an entirely conscious emotional experience (i.e., declarative knowledge), more recent thinking (see Fiori, 2009) recognises that emotionally intelligent behaviour has an automatic component (Winkielman & Berridge, 2004; Zeidner, Matthews, Roberts, & MacCann, 2003). Research to date has focussed much more on the conscious forms of ER, rather than the automatic forms, especially in relation to EI (e.g., Veseley-Maillefer et al., 2018; Maus, Bunge, & Gross, 2007). The following sections provide

Table 2

An Overview of the Process Model of Emotion Regulation (ER)

Stage of ER process	ER family	Definition	Examples of specific ER processes	Real life example
1. Situation	**Situation selection**	Approaching or avoiding certain people, places, or objects in order to regulate emotions	Confrontation Avoidance	Deciding not to attend a dreaded social event
	Situation modification	Taking external actions that directly alter a situation in order to influence its emotional impact	Problem solving Seeking social support Conflict resolution	Filing away a rejection letter rather than leaving it on the desktop
2. Attention	**Attentional deployment**	Directing one's attention with the goal of altering one's emotional response	Shifting gaze Distraction Rumination Mindfulness	Thinking about holiday plans while in a depressing meeting
3. Appraisal	**Cognitive change**	Modifying one's appraisal of a situation to regulate its emotional impact	Acceptance Denial Positive reappraisal Problem-focussed coping	Reminding self that characters in a distressing film are actors
4. Response	**Response modulation**	Directly influencing experiential, behavioural, or physiological components of the emotional response	Emotion expression Aggression Venting Suppression Substance use	Drinking alcohol to decrease feelings of anxiety

Note. Constructed using information extracted from Gross (2015) and Pena-Sarrionandia et al. (2015).

overviews of those key conscious and automatic mechanisms theoretically and/or empirically pertinent to EI and *acute* stress. It is important to acknowledge that these mechanisms do not occur independently of each other. For example, stress reactivity can be influenced by coping strategy selection (e.g., O'Connor, Nguyen, & Anglim, 2017), and rumination can predict increased attention to emotional information (e.g., Hilt, Leitzke, & Pollak, 2017).

3.3.1 Attentional deployment.

Attentional deployment, the controlled process of selectively concentrating on some stimulus in the internal or external environment, is a one of the first ER processes to appear in development (Johnson, 2009). Consciously (e.g., ruminating) or automatically regulating attention (e.g., shifting gaze) has been highlighted as one such cognitive pathway through which EI could buffer the effects of stress, and ultimately, promote well-being (e.g., Davis, 2018b).

3.3.1.1 Conscious attentional processing

Gross (1989a) suggests that under stress, cognitive strategies that direct one's attention, such as distraction, rumination, and mindfulness, can be deployed to manipulate one's emotional state. Those ER strategies have been explored in the context of EI, to differing extents, but mostly through the use of cross-sectional designs, and analysis of dispositional traits (i.e., trait rumination, trait mindfulness). For example, the mood repair scale of the Trait Meta Mood Scale (TMMS) predicted a smaller tendency to ruminate in one study (Salovey, Stroud, Woolery, & Epel, 2002). In another, high global TEI indirectly predicted less problematic social media use and problematic gaming via trait mindfulness and trait rumination (Kircaburun, Griffiths, & Billieux, 2019). Using a longitudinal design, Gómez-Baya and Mendoza (2018) showed that that TEI predicts a tendency to ruminate over positive emotions, and to distract oneself from negative emotions, for the TMMS subscales of attention to emotion, and emotion repair subscales, respectively.

Mindfulness is particularly effortful ER strategy of the Gross' model's attentional deployment family (1989a), and a construct for which there has been modest interest within the field of EI. Mindfulness involves receptive attention to one's psychological and physiological state (Brown & Ryan, 2003). Trait mindfulness (i.e., the tendency to be mindful) has been investigated extensively within the context of both TEI and AEI, as predictor (e.g., through mindfulness training; Ajilchi, Amini, Ardakani, Zadeh, & Kisely, 2019; Jung et al., 2016), as a predicted outcome (Miao, Humphrey, & Qian, 2018), as a trait moderator/mediator between EI and life outcomes (e.g., problematic online behaviour; Kircaburun, et al., 2019), and even as a component of EI (Ciarrochi & Godsell, 2006). However, the majority of studies that assess mindfulness and EI in stress contexts are intervention-based, where stress susceptibility is measured after individuals have undergone mindfulness interventions (e.g., Creswell, Pacilio, Lindsay, & Warren Brown, 2014; Nyklícek, Mommersteeg, van Beugen, & Ramakers, 2013). Few studies assess individual differences in the use of *state* mindfulness as an ER strategy under stressful conditions. While some state mindfulness scales have been developed (e.g., State Mindfulness Scale; Tanay & Bernstein, 2013), items are not always applicable to acute laboratory stressors which take place over a very short period of time, and require cognitive effort (e.g., "I noticed various sensations caused by my surroundings, e.g., heat, coolness"; "I found some of my experiences interesting"). Thus, EI and mindfulness will not be a focus for the present thesis. A more promising and feasible area relevant to acute stress regulation concerns EI and more automatic forms of attentional processing.

3.3.1.2 Automatic attentional processing

With regard to EI and attention, the number of studies examining automatic ER processes is small, but interest is increasing (for review, see Gutiérrez-Cobo et al., 2016). Recently, studies have begun to employ eye-tracking technology, which offers a rigorous paradigm whereby attention can be directly and continuously measured (Waechter, Nelson, Wright, Hyatt, & Oakman, 2014). Data from one such recent study suggests that when viewing images passively, TEI directs attention towards *positive* emotional stimuli (happy faces, positive social scenes), and away from socially threatening and neutral stimuli (angry faces, negative social scenes; Lea, Qualter, Davis, Pérez-González, & Bangee, 2018).

The above research, however, was conducted under non-stressful conditions; investigating attentional processing *under stress* is necessary to draw conclusions about the usefulness of EI 'in action'. Maladaptive attentional processing is a characteristic feature of anxiety disorders (for review, see Weierich, Treat, & Hollingworth, 2008), whereby anxious individuals show bias for negative emotional information, even at low threat levels. In contrast, *adaptive* processing embodies vigilance for threatening stimuli in stressful situations, but threat avoidance in non-stressful conditions (Davis, 2018b; Mogg & Bradley, 1998). Theoretically, attentional biases towards emotional information *should* constitute a core feature of EI (Fiori, 2009). Furthermore, if EI is truly adaptive in this sense, the pattern of visual processing of high EI scorers should align more closely with the adaptive profile (i.e., bias for threat in stressful condition only) than that of low scorers (generalised bias for threat).

Only three studies have examined the relationship between EI and attention under stress, each using a different methodology. In a study by Matthews, Pérez-González, Fellner, Funke, Emo, and Zeidner (2015), participants completed a visual search activity (to assess attention to emotion) following a cognitive stressor. Whilst TEI predicted less post-task distress, there were no associations between TEI and attentional processing. The other two studies used a dot-probe task, which assesses attentional bias for emotional stimuli over neutral stimuli. In the standard paradigm (MacLeod, Mathews, & Tata, 1986), two stimuli (cues) that differ in their emotional content (e.g., threatening versus neutral) are presented simultaneously, followed by the presentation of a probe (normally a triangle or other symbol). Participants then indicate the location of the probe as quickly and accurately as possible through keypress. Response to the 'attended' location is usually faster. Using a word-based dot-probe task, high TEI (self-control) individuals showed a bias for emotional words under stressful conditions, and a bias for neutral words under neutral conditions, with the opposite pattern observed for individuals with low TEI (Mikolajczak et al., 2009b). Findings therefore indicated that TEI may moderate the impact of stress by facilitating 'healthy' attentional processing. However, a complex myriad of findings was identified in a dot-probe study that employed eye-tracking (Davis, 2018b). In that study, high AEI management predicted bias away from angry faces, whereas TEI sociability and emotionality scales predicted bias towards angry and sad faces, respectively. However, those effects were consistent across stressful and non-stressful conditions, suggesting EI may *not* underlie adaptive emotional processing under stress. Given the small number of studies, and mixed findings, more testing is needed, especially with adolescent populations. This is addressed in Study 2 (Chapter 5).

3.3.2 Cognitive change

The family of ER strategies in Stage 3 of Gross' model refer to cognitive change; modifying one's evaluation of a situation to regulate its emotional impact (Gross, 1998a), or, more simply, "changing the way we think in order to change the way we feel" (p.4, Peña-Sarrionandia et al., 2015). Whilst the literature concerning EI and ER strategies, including cognitive change, has been extensively reviewed elsewhere (see Peña-Sarrionandia et al., 2015), the section below will review only the areas relevant to EI and cognitive change when experiencing *acute* stress (i.e., not those relating to EI and emotional regulation of long term problems): cognitive appraisal, and coping, the latter for which many studies have been published.

3.3.2.1 Cognitive appraisal

Some studies have explored the possibility that high EI individuals are more resistant to stress because they evaluate stressful situations more positively. How stressful a situation is perceived to be (and the subsequent emotional response) depends on the individual's cognitive appraisal – their subjective interpretation of the situation (Lazarus & Folkman, 1984). Cognitive appraisals are often divided into 'challenge' versus 'threat', whereby threatened individuals focus on the possibility for loss, while challenged individuals concentrate also on the potential gains (Tomaka, Blascovich, Kibler, & Ernst, 1997). Appraising stressors as threatening, rather than challenging, can hinder outcomes in stress-rich contexts such as examination performance (Giacobbi, Tuccitto, & Frye, 2007). Findings are mostly in support for EI as a predictor of more positive cognitive appraisals. Across multiple studies, individuals with high TEI scores appraised a stressful task as less threatening (Mikolajczak, et al., 2006; Mikolajczak & Luminet, 2008; Salovey et al. 2002).

Findings from Schneider, Lyons, and Khazon (2013) also indicated that high AEI (emotion management scale) was predictive of feeling more challenged and less threatened, but only in men.

3.3.2.2 Coping

Coping plays a crucial role in an individual's adaptation to stressful situations. Over time, researchers have moved away from the traditional view of coping as an unconscious defence mechanism (e.g., Vaillant, 1977), and towards the notion of coping as a conscious, deliberate response to stressful events (e.g., Folkman & Lazarus, 1985). When faced with a stressor, individuals can deploy a variety of coping strategies to manage their response (Lazarus & Folkman, 1984). One of the most common coping strategy categorisations is that comprising problem-focussed coping vs. emotion-focussed coping vs. avoidance coping (Skinner, Edge, Altman, & Sherwood, 2003), upon which many self-report coping inventories have been devised (e.g., the Coping Inventory for Stressful Situations; CISS; Endler & Parker, 1999). *Problem-focussed* coping strategies focus on tackling the source of stress directly, by taking constructive steps to remove or minimise the stress itself (i.e., problem-solving). In contrast, *emotion-focussed* coping does not tackle the root of the stress, but instead attempts to influence the emotions evoked by the stressor (e.g., breathing exercises, self-blame, catastrophizing). Alternatively, individuals may use *avoidance* coping strategies, motivated by wanting to 'escape' the stressor or its associated negative emotionality (e.g., deliberately distancing or detaching oneself from the situation). Identifying 'adaptive' strategies that can be universally applied across all contexts and individuals is not feasible (Carver & Connor-Smith, 2010), as the efficacy of any one strategy is context-dependent (Baker & Berenbaum, 2007; Folkman & Moskowitz, 2004). To establish the most appropriate way of coping in a stressful situation, sufficient attention needs to be paid towards the individual's coping resources, and specifics of the situation, such as the desired outcome - is it more important for the individual to perform well, to keep calm, or both? (Folkman & Moskowitz, 2004). The ER literature also emphasises the importance of *context* when determining 'adaptive' ways of responding to stress (Gross & Thompson, 2007).

Generally, the aims of EI research on coping falls into one of two categories: first, to test whether EI scores correlate with scores from established dispositional or situational coping scales, or second, to examine whether coping mediates the associations between EI and some adaptive outcome (Zeidner et al., 2012b). There is a considerable quantity of research supporting the former, since links are often established between both TEI and AEI, and 'adaptive' coping (Bastian, Burns, & Nettlebeck, 2005; MacCann et al., 2011; Mikolajczak et al., 2008; Saklofske, Austin, Galloway, & Davidson, 2007). Evidence also supports the second assertion. Effective coping often mediates the relationship between EI and adaptive outcomes in student samples (e.g., exam-related stress; Austin et al., 2010). In adolescents specifically, emotional-focussed and avoidant coping (which typically represent maladaptive strategies in most cases) mediate low EI and psychological distress (Chan, 2005), self-harming behaviours (Mikolajczak, Petrides, & Hurry, 2009c), and externalising and internalising symptoms (Downey et al., 2010). Furthermore, TEI and AEI might work in tandem with respect to coping with stress, where AEI promotes initial strategy selection, and TEI promotes coping effectiveness (Davis & Humphrey, 2012a; 2014).

However, there are a very limited number of investigations that examine EI and state coping in task-oriented contexts (i.e., when actually confronted with an acute stressor). To date, three studies have tested the relationship between EI and coping under acutely stressful conditions (two with TEI, one with AEI). Salovey et al. (2002, Study 2) identified that participants with greater scores on the mood repair scale of the TMMS were less likely to engage with avoidant coping under psychosocial stress. Similarly, high AEI scorers used less avoidant coping strategies when exposed to cognitive stressors (e.g., impossible anagrams) (Matthews, Emo, Funke, Zeidner, Roberts, Costa, & Schulze, 2006). In another cognitive task (timed tower of Hanoi), TEI was related to less maladaptive *emotion-focussed* coping (e.g., self-blame) (O'Connor et al., 2017). Whilst all suggest an adaptive role for EI, all three studies utilised undergraduate psychology student samples. In general, coping repertoires increase with age (Compas, Malcarne, & Banez, 1992), with adolescence forming a key developmental period in this regard. An integrative review of coping across childhood and adolescence by Zimmer-Gembeck and Skinner (2011) used the findings of 58 studies to hypothesise a developmental trajectory for coping, whereby adolescence witnesses development of more adaptive problem-focussed coping, as instrumental action becomes supplemented by planful problem-solving in challenging situations. However, the developing ability to attend and reflect on internal emotional states in adolescence can also lead to the use of more emotion-focussed coping strategies. Based on this, we might expect that the role of EI in coping in stressful conditions could differ between adolescents and adults (see Study 1, Chapter 4).

3.3.3 Emotional response modulation

The fourth family of ER in Gross' model concerns the modulation of the stress response once an emotion has been elicited (Gross, 1998a). Stress reactivity and recovery could be said to represent outcomes/consequences of ER processes, rather than constituting ER process themselves (Peña-Sarrionandia et al., 2015). Nevertheless, the ways in which individuals present their stress response, and how they recover, have important consequences for adaptation (e.g., Geurts & Sonnentag, 2006; Henze, Zankert, Urschler, Hiltl, Kudielka, Pruessner, & Wust, 2017). When confronted with a stressor, individuals need to initiate a “fight or flight” response, and then shut off the response once the stressor ceases (McEwen, 2006). When confronted with a stressor (real, anticipated, or imagined), the ‘fight or flight’ response needs to be activated, which typically initiates two physiological pathways: the sympathetic-adrenal-medullary (SAM) pathway of the autonomic nervous system (ANS), and the hypothalamic-pituitary-adrenocortical (HPA) axis (McEwen, 2006). Upon first detection of the stressor, the SAM axis initiates a rapid response, in which sympathetic neurons stimulate the release of catecholamines (e.g., adrenaline, noradrenaline) from the adrenal glands (Cohen, Kessler, & Gordon, 1995). Circulating catecholamines then catalyse a cascade of physiological changes relating to metabolism (e.g., gluconeogenesis, respiration (e.g., increased respiratory rate), and circulation (e.g., increased heart rate), and adaptive behavioural changes (e.g., increased alertness) (Cohen, et al., 1995). The hypothalamus also activates the HPA axis response, stimulating the production of stress hormones (notably, adrenocorticotropin hormone; ACTH) from the paraventricular nucleus, which consequently (via the pituitary gland) promotes secretion of glucocorticoids such cortisol from the adrenal cortex; the final effectors of the HPA axis (Tarullo & Gunnar, 2006). Ultimately, the purpose of these mechanisms is to lead to the individual’s preparedness and readiness to respond to the stressor (see Russell & Shipston [2015] for a comprehensive description of the physiological and endocrinal aspects of the stress response, and the implicated neuroanatomical regions).

There are important differences to note between acute and chronic stress. Whereas the above biological and behavioural processes describe how an individual would typically respond to a sudden, unexpected event (i.e., *acute* stress), *chronic* stress describes prolonged elevation of the stress markers (McEwen, 2017). For example, an individual with persistent elevation of heart rate or cortisol can be described as experiencing chronic stress, sometimes termed “allostatic overload” (McEwen, 2003). It follows that dysregulated acute stress responding could, over time, lead to chronic stress, since physiological and psychological equilibrium is not sufficiently restored between acutely stressful experiences (Compas, 2006).

3.3.3.1 Stress reactivity

Stress reactivity represents describes the extent or capacity to which an individual responds to an acute stressor (Schlotz, 2013). Whilst still debated (see Hu, Lamers, de Geus, & Penninx, 2016; Phillips, Ginty, & Hughes, 2013), hyperreactivity to acute stress is generally deemed to be harmful to the individual and their performance (e.g., Arora, Ashrafian, Davis, Athanasiou, Darzi, & Sevdalis, 2010; Rano, Fridén, & Eek, 2018). To correspond with that pattern of adaptive stress responding, high EI individuals should display less emotional and physiological reactivity in stressful situations, and recover more quickly, than their low EI peers (Lea et al., 2019; Mikolajczak, Petrides, & Hurry, 2009c; Peña-Sarrionandia et al., 2015). To study that hypothesis, experimental studies typically induce stress in participants, and then test whether their level of EI relates to the magnitude of their response, and/or how fast they recover from the stressor, using either objective or self-reported index of the stress response (Lea et al., 2019).

There is growing empirical interest in exploring whether EI relates to stress reactivity (for systematic review, see Lea et al., 2019), with research crossing disciplines as diverse as medicine (e.g., performing surgery; Arora, Russ, Petrides, Sirimanna, Aggarwal, & Sevdalis, 2011), sport (e.g., marathon running; Lane & Wilson, 2011), and education (e.g., academic examinations; Lane, Thelwell, & Devonport, 2009). However, the vast majority of studies to date have used an adult sample, typically comprising undergraduate students (Lea et al., 2019). Only three studies have explored EI and stress reactivity in younger populations: one with adolescents ages 13–15 years (Ciarrochi, Chan, & Bajgar, 2001), and two with children ages 7–12 years (Aminabadi, Erfanparast, Adhami, Maljaii., Ranjbar, & Jamali, 2011; Aminabadi, Adhami, Oskouei, Najafpour & Jamali, 2013). Crucially, no studies have examined EI and stress reactivity in adolescents between the ages of 16 and 18 years. Furthermore, there is considerable methodological heterogeneity in this area. Studies span both EI conceptualisations (i.e., TEI; AEI), induce stress differently (e.g., a speech; Ling, Raine, Gao, & Schug, 2018; recalling a negative life decision; Sevdalis, Petrides, & Harvey, 2007), use a range of EI measures (e.g., TMMS, TEIQue), and operationalise stress using a variety of psychological and physiological indices (e.g., heart rate [HR]; Laborde, Brüll, Weber, & Anders, 2011; change in negative affect [NA]; Davis, 2018b).

Findings are unsurprisingly inconsistent, producing a complex pattern of findings overall (Lea et al., 2019). Depending on the context, EI has been shown to increase reactivity, decrease reactivity, or have no significant effects. Evidence generally suggests that whether EI is useful under acute stress is highly dependent on the stress context, and how EI is measured. Overall, TEI significantly predicts adaptive stress reactivity in the context of sports-based stressors (e.g., a sports competition), and cognitive stressors (e.g., a memory task), but not others (psychosocial stress). For example, high TEI individuals typically secrete *less* cortisol (the main stress hormone) in response to a challenging cognitive task (e.g., Mikolajczak et al., 2007), but *increased* cortisol during public speaking (Thomas, Fuchs, & Klaperski, 2018), than their low TEI counterparts. However, the picture is less clear for AEI, since there is a dearth of AEI research. While AEI buffered *subjective* stress in one study (Ruiz-Aranda, Salguero, & Fernández-Berrocal, 2011), it had no significant effect in two others (Limonero, Fernández-Castro, Soler-Oritja, & Álvarez-Moleiro, 2015; Matthews et al., 2006). AEI appears to intensify *physiological* stress (Bechtoldt & Schneider, 2016; Rash & Prkachin, 2013). Ultimately, it is not clear whether EI is an adaptive resource with respect to stress reactivity.

There are several methodological issues apparent in the research exploring EI and stress modulation (Lea et al., 2019). First, an overreliance on TEI over AEI tools is evident, introducing the risk of socially desirable responding, and (when stress is also measured using self-report) common method bias, where the tendency to self-rate positively can mask test effects (Keefer, et al., 2018; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Only a minority of studies measure emotional *competencies* (i.e., AEI), and very few measure both TEI *and* AEI. Sole focus on either construct misses the opportunity to examine the respective roles of perceived and actual emotional skills; measurement of both EI conceptualisations is preferred. Second, few studies control for confounding variables. Many studies fail to control for potential confounding influences, such as personality and cognitive ability. Considering TEI is widely acknowledged as a lower order personality trait (Petrides et al., 2007), it is concerning that so few TEI studies account for personality to some extent. Similarly, very few studies control for cognitive ability, a closely linked construct to AEI (Mayer et al., 2008). Another issue relates to the robustness of the stress induction paradigms within the EI field: less than half of conducted studies include a control group (Lea et al., 2019). Furthermore, a common issue is that the majority of studies in the stress literature only examine subjective (self-reported) stress reactivity, which is problematic, given that subjective and objective measures of stress only correlate approximately 25% of the time (e.g., Andrews, Ali, & Pruessner, 2013; Oldehinkel, Ormel, Bosch, Bouma, van Roon, Rosmalen, & Riese, 2011). In other words, how stressed an individual feels does not always relate to physiological stress markers, and we therefore cannot assume one stress variable will predict another. All studies in the programme of research explore EI and physiological and/or psychological reactivity to some extent, while addressing the above methodological issues (see Chapters 4-6).

3.3.3.2 Stress recovery

The health advantage of EI may also lie in the ability to mentally and physically return to baseline following a stressful experience. Stress reactivity and stress recovery ("conceptual siblings separated at birth"; Linden, Earle, Gerin, & Christenfeld, 1997, p.1) are *both* revealing aspects of the stress response. Several studies have examined whether EI predicts how quickly individuals recover, or 'bounce back' from acute stress, by continuing to monitor indices of stress after the stressor has ceased. Recovering faster from stressful experiences is advantageous in most contexts (Burke et al., 2005; Geurts & Sonnentag, 2006), as this restricts exposure to the harmful 'fight or flight' cascade to only that which is necessary (e.g., increased cortisol levels and cardiac activity; McEwen, 2017).

EI appears beneficial in this regard, for both the short and long term. For example, in the laboratory setting, individuals with high TEI show faster recovery following the viewing of distressing video footage (Fernández-Berrocal & Extremera, 2006), and in medical students, after performing a new surgical task (Arora et al., 2011). TEI has also predicted more adaptive cardiac recovery after archers participated in a challenging shooting session (Dal & Doğan, 2019). AEI also promoted recovery after exposure to emotional imagery, and recalling a sad memory (Limonero et al., 2015; Rash & Prkachin, 2013). TEI also seems to promote recovery over longer periods of time (e.g., recovering from personal failures, Boss & Sims, 2008; emotional adjustment following an ultra-endurance event; Nicolas, Martinet, Millet, Bagneux, & Gaudino, 2019). Perhaps EI might lead to more efficient (e.g., faster) emotion information processing (EIP) in stressful contexts, aiding recovery (Fernández-Berrocal & Extremera, 2006; Matthews et al., 2002). Ultimately, EI may be useful in the case of reactivity and recovery from acute stress, but this is potentially dependent on the context (e.g., stressor type), EI measurement (i.e., TEI, AEI), and sample (no studies have been conducted with adolescents) (see Study 1, Chapter 4).

An alternative line of enquiry concerns EI as a moderator of cognitive processes immediately following the stressor. Rumination, which describes the process of focussing and brooding on negative emotions (e.g., worrying about an exam that did not go as well as anticipated), is often identified as a robust risk factor for psychopathology in adolescence (Rood, Roelofs, Bogels, Nolen-Hoeksema, & Schouten, 2009). Evidence indicates that individuals who ruminate more after a psychosocial stressor (i.e., those who dwell on the negative experience of the stressor, even when there is little one can do about it) not only exhibit impaired emotional recovery (LeMoult, Arditte, D'Avanzato & Joorman, 2013) but also heightened cardiovascular activity (Key, Campbell, Bacon & Gerin, 2008). Furthermore, post-stressor rumination can also strengthen an attentional bias for emotional material (Hilt et al., 2017; LeMoult et al., 2013). Thus, EI could enhance mental health outcomes by reducing the extent to which an individual dwells on past stressors. To the best of the author's knowledge, only two studies have directly tested that hypothesis. The first identified that the clarity subscale of the TMMS was associated with less ruminative thought following an experimental stressor (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995), whereas a negative association between emotion management (i.e., AEI) and rumination after an emotional event was shown by the second study (Lanciano, Curci & Zatton, 2010). Furthermore, work by Szczygieł and Mikolajczak (2017) showed that individuals with high TEI are more likely to *savour* positive emotions, complementing the notion that high EI individuals may be less inclined to dwell on negative experiences. However, it is not yet known how EI relates to post-event rumination in adolescents, or how those variables relate to other indices of acute stress responding (see Study 2, Chapter 5). EI may exert a protective effect by speeding up psychological and physiological recovery, and limiting the extent to which young people ruminate about the stressful event.

3.4 EI and acute stress: What needs to be done

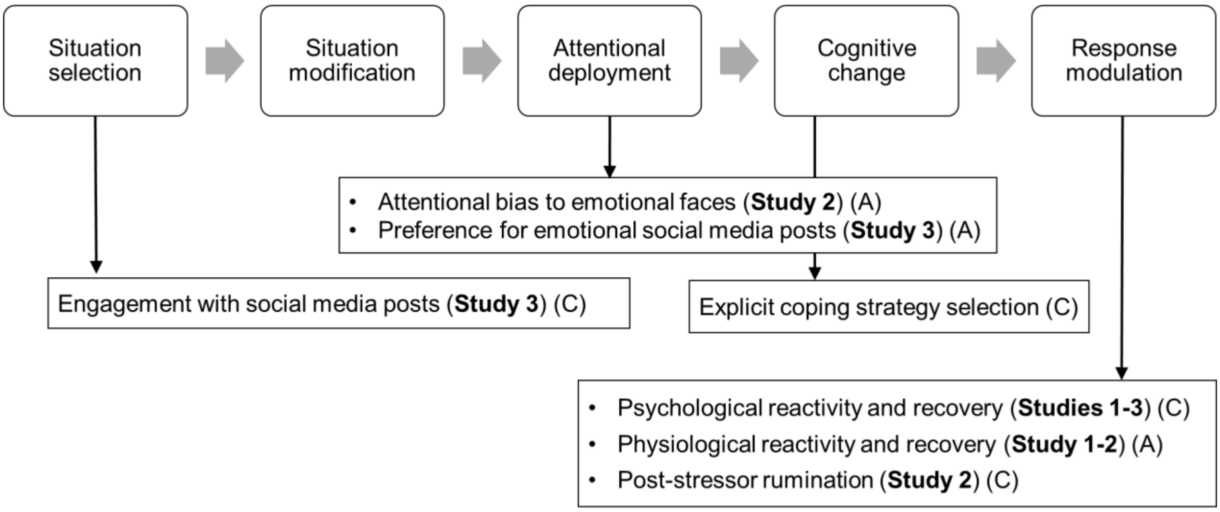
Understanding the ways in which EI may be helpful (or not) for older adolescents is imperative. Effective stress regulation would greatly benefit 16-18 year olds, a group that is especially susceptible to experiencing stress and mental health issues (e.g., Sadler et al., 2018; National Society for the Prevention of Cruelty to Children [NSPCC], 2017). Although there have been several initiatives that attempt to train EI in schools, awareness of the mechanisms underpinning EI and stress responding would enable these to be theoretically grounded, and empirically supported. The majority of research to date concerning EI and stress has been cross-sectional, which does not indicate how, why, or when, EI may buffer the effects of stress for young people. A process-oriented approach is needed to understand how EI contributes to more adaptive stress regulation, by assessing how EI moderates ER processes under stressful conditions (Peña-Sarrionandia et al., 2015). This requires an acute stress approach: examining EI 'in action', using situational stressors.

It is also important to acknowledge stress regulation in more applied contexts, in addition to lab-based settings. Social networking sites (SNS) are a relatively new stressor highly relevant to adolescents (Fox & Moreland, 2015), on which 91% of 16-24 year olds are active (Royal Society for Public Health [RSPH], 2017). In particular, there are emerging concerns that the heightened emotional sensitivity and protracted development of cognitive control in adolescents may make them especially reactive to emotion-arousing material accessed on social media (Crone & Konijn, 2018). However, evidence around well-being and social media is very mixed, whereby social media use can be either beneficial *or* detrimental (Marino, Gini, Vieno, & Spada, 2018; Orben & Przybylski, 2019; Verduyn, Ybarra, Resibois, Jonides, & Kross, 2017; Zhan, Sun, Wang, & Zhang, 2016). A new school of thought considers that the relationship is dependent on *how* social media is utilised (i.e., which material is engaged with) (Seabrook, Kern, & Rickard, 2016), and *individual differences* in social media use (Vannuci & Ohannessian, 2019). EI could protect mental health via 'healthier' online behaviour, and proficient ER in relation to online material, although that hypothesis has not yet been tested (see Study 3, Chapter 6).

The programme of research outlined in this thesis rigorously tests several hypotheses related to the stress-buffering function of EI, with reference to multiple conscious and automatic ER processes, outlined in **Figure 6**. These are: psychological (Studies 1, 2 and 3) and physiological stress reactivity (Studies 1 and 2), coping under stress (Study 1), attentional processing under stress (Studies 2 and 3), psychological and physiological recovery from stress (Study 1), post-stress rumination (Study 2), and situation selection (Study 3). **Figure 6** provides an overview of the mechanisms that are focussed upon within the programme of research, and indicates the studies in which they can be located. These are presented under the original ER families theorised by Gross (1998a), and categorised as either a conscious process (C), or an automatic process (A).

Figure 6

An Overview of the ER Mechanisms Explored Within the Programme of Research



Note. 'C' denotes a conscious process, and 'A' denotes an automatic process. Stages match those in Gross' (1989a) model of emotion regulation.

CHAPTER FOUR

EMOTIONAL INTELLIGENCE AND ACUTE STRESS REACTIVITY AND RECOVERY IN ADOLESCENTS

4.1 Chapter overview

No research has yet examined whether EI relates to the direct modulation of the acute stress response in later adolescence. To correspond with the pattern of adaptive stress responding, high EI individuals should display less emotional and physiological reactivity in stressful situations, and recover more quickly, than their low EI peers (Lea et al., 2019; Mikolajczak et al., 2009a; Peña-Sarrionandia et al., 2015). This chapter presents the methods and findings of Study 1, an experimental study. The extent to which EI moderated stress reactivity and recovery was assessed in 58 adolescents aged 16-18 years, following exposure to an acute psychosocial stressor. Findings indicated that trait EI (TEI) predicted physiological stress reactivity: higher levels of global TEI (and the sociability subscale) predicted a less extreme increase in HR in response to the stressful situation. By placing the findings of the present study in context, it would seem that within TEI's nomological network, agreeableness, assertiveness, and self-efficacy, are the key TEI factors involved in facilitating adaptive ER in psychosocially stressful situations. Moreover, given that ability EI (AEI) did not relate to stress outcomes, findings suggest that how confident adolescents feel about their emotional abilities matters more for stress regulation than their actual emotion-cognitive skill, at least in social settings.

4.2 Introduction

One mechanism through which EI may lead to positive effects is by acting as a ‘stress buffer’ (Mikolajczak et al., 2009a; 2009b). Specifically, EI may help to directly modulate the stress response, by minimising the (acute) stress experienced in demanding situations, or situations perceived as demanding (Lea et al., 2019). Of particular interest to researchers is stress reactivity – a disposition that describes the extent or capacity to which an individual responds to an acute stressor (Schlotz, 2013). Psychological and biological processes of reactivity are central to understanding the physical and emotional consequences that can result from overexposure to stress (Compas, 2006).

While abnormal stress reactivity has been repeatedly investigated as a vulnerability marker for various somatic and psychological issues, the nature of what constitutes ‘adaptive’ reactivity remains a strongly debated topic. Specifically, there is disagreement on whether heightened (i.e., *hyper*arousal) or blunted reactivity (i.e., *hypo*arousal) poses more of an issue for adaptation (see Hu et al., 2016; Phillips et al., 2013). Traditionally, heightened stress reactivity has been associated with the worsening of long-term health risks, notably cardiovascular disease (e.g., Chida & Steptoe, 2010; Lovallo, 2011), due to allostatic overload resulting in “chronic wear and tear” on the stress systems of the body (McEwen, 2003; McEwen, 2004; McEwen, 2008). However, harmful effects can also be short-term. For example, high levels of acute stress can impair decision-making (LeBlanc, 2009; Arora et al., 2010), sport performance (van der Does, Brink, Otter, Visscher, & Lemmink, 2017; Rano et al., 2018), and short-term memory capacity (e.g., Kuhlmann, Piel, & Wolf, 2005; Shields, Sazma, McCullough, & Yonelinas, 2017). However, other (limited) evidence has suggested that *blunted* physiological reactivity can also have adverse outcomes, particular in clinical groups (see Carroll, Lovallo, & Phillips, 2009). A recent systematic review of stress reactivity and health (n = 48 papers) attempted to resolve the conflict in the literature, with findings indicating that both hyperarousal *and* hypoarousal to acutely stressful stimuli were detrimental to health outcomes (Turner et al., 2020). Findings were somewhat nuanced, however, whereby each type of dysregulation predicted different long-term negative health outcomes (e.g., hyperarousal: increased blood pressure; hypoarousal: increased BMI). Thus, both perspectives on dysregulated stress reactivity warrant investigation. Furthermore, because the stress pathway is complex, involving arousal of both the ANS and the hypothalamic-pituitary-adrenocortical (HPA) axis (e.g., McEwen, 2003; 2004; 2008), acute stress can be measured in a multitude of different ways. Commonly used physiological indices of stress reactivity include cardiac measures (including heart rate [HR], heart rate variability [HRV], blood pressure), cortisol secretion, electro-dermal activity (EDA), electroencephalography (EEG), and pupil dilation (Lea et al., 2019). While those biomarkers are free from self-report biases, biomarkers are often not a reliable indicator of stress on their own, and are usually applied together with self-report questionnaires to contextualize the measurements. Both subjective and objective stress reactivity have adaptive value: they show independent predictive validity, yet are often only weakly correlated with each other (e.g., Campbell & Ehlert, 2012; Christensen, Dich, Flensborg-Madsen, Garde, Hansen, & Mortensen, 2019).

When deciding which perspective to take on the issue (i.e., how much reactivity is adaptive), it is important to note that the majority of the literature concerning stress reactivity is focussed on adults, yet the magnitude and duration of the stress response varies across the lifespan. In particular, stress response pathways undergo significant development during mid-late adolescence (Hollenstein, McNeely, Eastabrook, Mackey, &

Flynn, 2012; Spear, 2000). Brain regions associated with emotionality and stress reactivity, such as the hippocampus, amygdala, hypothalamus, and prefrontal cortex, continue to mature well into young adulthood (Gogtay et al., 2004; Spear, 2000). Evidence suggests that, compared to adults and children, adolescents tend to show heightened reactivity to acute stressors, both physiologically and behaviourally (Romeo, 2013; Stroud, Foster, Papandonatos, Handwerger, Granger, Kivlighan, & Niaura, 2009). Moreover, as a sensitive developmental period, overexposure to acute stress, or a disposition for exhibiting heightened reactivity, can be particularly problematic in adolescence (Roberts & Lopez-Duran, 2019; Romeo, 2013). For example, the aforementioned emotion-related brain regions are extremely sensitive to stress hormones at this time (Gogtay et al., 2004; Spear, 2000). When the protracted maturation of emotional neuroanatomy is combined with heightened stress reactivity during adolescence, this can present a “perfect storm” in the context of psychological adaptation (Romeo, 2013). Indeed, the limited evidence available for older adolescents suggests that heightened physiological and emotional reactivity to stress predicts an increased risk for internalising and externalising problems (Ortiz & Raine, 2004; Owens, Helms, Rudolph, Hastings, Nock, & Prinstein, 2018). There is little controversy over the adaptive pattern concerning stress *recovery* – how individuals ‘bounce back’ from acute stress (Linden et al., 1997). Theoretical, empirical, and clinical perspectives posit that the faster an individual recovers from a stressor, the better (Geurts & Sonnentag, 2006). It is imperative that once the stressor no longer poses a danger to the individual, the “fight or flight” cascade stops, to prevent allostatic overload, and subsequent “wear and tear” on the body’s stress systems (McEwen, 2017). Thus, adolescents that show an adaptive stress response should show *less* reactivity, and recover *faster*.

4.2.1 Acute stress responding: A role for EI?

Researchers are increasingly turning to emotion-related dispositions in the search for individual differences that might modify stress responding in young people. Increasingly, investigations into the processes of EI, and its stress-buffering effect, are acknowledging the vast body of ER literature (Peña-Sarrionandia et al., 2015). Gross' ER framework is often used for this purpose (e.g., Moriya & Takahasji, 2013; Scheibe & Zacher, 2013; Troy & Mauss, 2011). As discussed in Chapter 3, the emotional response modulation family of ER processes (Gross, 1998a) – directly influencing physiological, behavioural, and psychological components of the emotional response – has important consequences for adaptation. Modifying one's psychological and/or physiological stress reactivity (i.e., the extent to which someone 'reacts' to a stressful situation) could reflect an important mechanism through which EI may help offset potentially deleterious stress-induced alterations in physiology and behaviour, and lead to positive life outcomes (Keefer et al., 2018). However, as highlighted by Chapter 3 (and the associated publication: Lea et al., 2019), there is no published research examining whether EI buffers stress reactivity in adolescents. The role of EI in stress response modulation processes in adolescents could be investigated from multiple perspectives. However, considering both 'types of EI (i.e., TEI; AEI), both psychological and physiological aspects of stress reactivity, and stress recovery, would thoroughly test the hypothesis that EI buffers the effects of acute stress.

The majority of research into EI and stress thus far is correlational and/or cross-sectional, often limited to questionnaire-based studies that test for associations between EI and an aspect of self-reported dispositional or chronic stress. However, to substantiate claims of EI as a stress buffer, the process needs to be demonstrated "in action," using controlled, experimental stress paradigms (Mikolajczak et al., 2009a; 2009b). While responses to laboratory-induced stress are not of clinical importance *per se*, they *do* represent the way that individuals ordinarily respond to everyday challenges (Henze et al., 2017), and dysregulated responses to those acute stressors can present both short-term (e.g., LeBlanc, 2009; Arora et al., 2010), and long-term consequences for adaptation (e.g., Chida & Steptoe, 2010; Lovallo, 2011). In adults, experimental studies that have examined EI and stress reactivity and recovery have produced mixed findings (Lea et al., 2019; Chapter 3, Section 3.3.3). Evidence generally suggests that whether EI is useful under acute stress is highly dependent on the stress context, and how EI is measured. Overall, TEI significantly predicts adaptive stress reactivity in the context of sports-based stressors (e.g., a sports competition), and cognitive stressors (e.g., a memory task), but not others (psychosocial stress; emotive stimuli). For example, high TEI individuals typically secrete less cortisol (the main stress hormone) in response to a challenging cognitive task (e.g., Mikolajczak et al., 2007), but increased cortisol during public speaking (Thomas et al., 2018), than their low TEI counterparts. However, the picture is less clear for AEI, since there is a dearth of AEI research. While AEI buffered subjective stress in one study (Ruiz-Aranda et al., 2011), it had no significant effect in two others (Limonero et al., 2015; Matthews et al., 2006). AEI appears to intensify physiological stress (Bechtoldt & Schneider, 2016; Rash & Prkachin, 2013). Ultimately, it is not clear whether EI is an adaptive resource with respect to stress reactivity, especially in adolescents. However, the experimental literature suggests that EI appears useful for stress *recovery* in adults, in both the short and long term (Chapter 3, Section 3.3.3.2).

It is also unclear *how* EI might influence stress reactivity and recovery. One school of thought is that EI may buffer stress reactivity through effects on situational coping. To address the absence of research that examines the relationship between situational coping and EI in adolescent samples, the present study also assessed coping as an ER strategy (Chapter 3, Section 3.3.2.2; Gross, 1998a). While evidence suggests that EI promotes more adaptive coping in adults for both TEI and AEI (e.g., Matthews et al., 2006; et al., 2002, Study 2; O'Connor et al., 2017), we might expect that the role of EI in coping in stressful conditions could differ between adolescents and adults (Compas et al., 1992). In addition, evidence suggests that coping with a stressor effectively might have a beneficial influence on stress reactivity (i.e., adaptive coping relates to less reactivity, e.g., Dunkley, Mandel, & Ma, 2014). Together, the literature hints at a potential mechanism through which EI may buffer acute stress (i.e., through a reduction in psychological and physiological stress reactivity, via selection of more adaptive coping strategies). Studies typically employ (moderated) mediation analyses to investigate whether coping mediates the relationship between EI and stress outcomes (e.g., Matthews et al., 2006; Mikolajczak et al., 2008), an approach also taken by the present study.

There are additional issues with the body of literature described thus far. Two thirds of studies examining EI and stress responding do not control for any additional variables that may have confounded with EI to influence reactivity or recovery variables, such as personality, cognitive ability, or mental health (Lea et al., 2019). As discussed in Chapter 2, EI can theoretically and empirically overlap with several constructs. TEI is widely acknowledged as a lower order personality trait (Petrides et al., 2007), and AEI is closely linked with cognitive ability (Mayer et al., 2008). Therefore, studies measuring TEI and AEI should routinely account for those confounding influences, to clearly define EI's relationship with stress regulation. Furthermore, acute stress responding can be affected by clinical symptomology. Individuals with depression (Burke et al., 2005), and anxiety (de Rooij, Schene, Phillips, & Roseboom, 2010) can show blunted stress reactivity, and impaired stress recovery, compared to controls. Critical evaluation of empirical literature in the area also reveals serious quality issues, namely a lack of experimental control; only 22% of studies used an explicit control group for their stress induction paradigm (Lea et al., 2019). The present study aims to overcome those limitations by using a clearly defined control group, and including personality, cognitive ability, and mental health, as covariates. Furthermore, the participant sample comprises a ‘forgotten’ group in empirical research: 16-18 year olds (Kennedy, 2010). EI could be especially helpful for older adolescents, considering that neuroscientific, statistical, and behavioural evidence suggests that older adolescents experience significant daily stress (**Figure 3**), and are undergoing significant stress regulation development (e.g., Chapter 2 Section 2.2; Esnaola et al., 2017; Gardner & Steinberg, 2005; Giedd et al., 1996; 1999; Zarrett & Eccles, 2006). While not all older adolescents go on to develop adverse outcomes as a result of exposure to normative stressors, the number of those that do go on to develop mental health issues is rising (e.g., Sadler et al., 2018). It is therefore important that we understand whether EI could act as a useful individual-level resource with respect to stress reactivity and recovery.

4.2.2 Aims and hypotheses

The present study employs comprehensive (measuring TEI *and* AEI, physiological *and* subjective stress) and robust (i.e., control group, controlling for confounders) methodology in an empirically neglected population (older adolescents). Specifically, the present study aimed to test whether EI moderates acute stress reactivity and recovery in adolescents aged 16-18, and if so, whether that relationship is mediated by coping strategy selection. To address this aim, three hypotheses were developed, based on findings from findings derived from adult data (Lea et al., 2019). First, it is predicted that TEI will predict less psychological reactivity and HR reactivity in the stress condition **(H1).** Second, **H2** predicts TEI will predict faster recovery from stress. Due to the aforementioned inconsistency of the evidence regarding AEI and stress reactivity and recovery, directional hypotheses for AEI cannot be generated. Third, **H3** predicts that TEI and AEI will predict greater use of adaptive coping strategies (i.e., more task-focussed coping, less emotion-focussed coping, and less avoidant coping). However, to test whether coping explains the relationship between EI and stress reactivity, further analyses are needed. For this, studies typically use mediation analyses to establish whether EI acted on stress responses through coping, similar to the approach taken by Mikolajczak et al. (2008), and Matthews et al. (2006). Thus, finally, it is hypothesised that the relationship between EI and reactivity will be mediated by emotion-focussed coping strategies and/or avoidant coping strategies (**H4**). In all cases, exploratory analyses were also conducted using TEI factor scores. Since TEI is an umbrella term for emotional traits and dispositions, not a unidimensional construct (Petrides et al., 2007), drawing conclusions about 'whole' TEI alone does not make conceptual sense without an appreciation for its component parts. Analysis at the subscale level provides more meaningful interpretations than working with composite TEI scores, and helps elucidate which elements of TEI are most useful in different contexts (Downey et al., 2010; Zeidner et al., 2012a). Such analyses are exploratory, however, as there is insufficient evidence to suggest directional hypotheses with respect to specific TEI subscale – few studies provide data for such analyses.

4.3 Method

4.3.1 Design

To clarify whether EI is adaptive in terms of responding to acute stress, the present study used an experimental approach, comparing the relationship between EI and stress reactivity under acutely stressful versus neutral (i.e., control) conditions. An experimental, between-groups design was selected, with the study comprised of two parts: an online questionnaire battery, and an in-person experimental session. There were two independent variables: experimental condition (randomly assigned; stressful vs. control) and EI (TEI; AEI: emotion management [AEI(EM)] and emotion understanding [AEI(EP)]; all continuous variables), and three dependent variables: subjective stress reactivity (i.e., mood), physiological stress reactivity (i.e., HR), and coping (task-based; emotion-based; avoidance). Participants were assigned to one of the two conditions using an online random number generator (https://www.randomizer.org). Sex, the Big Five personality traits, cognitive ability, and mental health, were included as covariates in analyses. Ethical approval was granted by the Humanities and Social Sciences Research Ethics Committee (HASSREC) at the University of Worcester in June 2017 (HASSREC code: HCA16170033). **Appendix A** provides an extended discussion on the choice of design, stressor, and analysis for the present study.

4.3.2 Participants

A-priori power analyses conducted using G*Power (Erdfelder, Faul & Buchner, 1996) suggested a minimum of 128 participants to achieve .80 probability of detecting a true medium-sized effect using hierarchical regression (Field, 2017), and this was used as the recruitment target for the study. However, recruiting participants within a narrow age band (i.e., between the ages of 16 and 18 years) presented a challenge (largely due to difficulties in making direct contact with head-teachers). Thus, a convenience sample of 74 adolescents was consequently recruited from a state Sixth Form college in the West Midlands with which the researcher had professional contacts. A review of empirical studies examining EI and stress reactivity (Lea et al., 2019) indicated that, in practice, approximately 50-100 participants was the 'norm', suggesting that *n* = 74 is not anomalous for the field. Initially, an email containing brief information about the study (**Appendix B**) was sent to the head-teacher of the college. The email stated that the researcher would follow up with a phone-call 7 days later. The headteacher expressed interest during the phone-call, and so a meeting was arranged to discuss the study particulars, attended by the researcher, head-teacher, and a member of the student safe-guarding team. Following consent to take part at the institution-level, arrangements were made to recruit students to take part in the study (details provided in 'Procedure' section).

In the most recent available report by Ofsted (the UK government office responsible for inspecting and regulating schools and colleges), the participating Sixth Form college was rated 'Good'. Ofsted also suggests that the West Midlands performs broadly in line with England as a whole at with respect to secondary and further education (Ofsted, 2014). In addition, the ethnicity data obtained for the city within which the college was situated revealed a comparable, though slightly lower, proportion of people with a Black and Ethnic Minority origin (BME) (12.6%), than for the general population of England (20.2%) (UK Census, 2011). Furthermore, during 2017/2018, when data collection took place, the mean percentage of students eligible for and claiming free school meals in state funded secondary schools and colleges for Worcestershire (9%) was slightly less than for England as a whole (12.4%), (Department for Education, 2019). The prevalence of free school meal eligibility is a reliable proxy measure of disadvantage of an area (Kounali, Robinson, Goldstein, & Lauder, 2008). In sum, statistics suggests that the sample was *broadly* representative of the UK population as a whole in terms of socioeconomic factors.

Of the 74 participants whom provided consent, 58 completed the entire study. Those that completed both parts and those that did not did not statistically vary in composition of either sex or age (*p*s > .05). The final sample comprised 48 females and 8 males (2 participants selected 'Other'); 42 were 16 years, 11 were 17 years and 5 were 18 years old.

4.3.4 Measures

To minimise disruption to teaching time, the battery of questionnaire measures was completed online in participants' free time. However, as drop-out rate for completing an online questionnaire battery is concerning (Hoerger, 2010) maximising completion rates was imperative. Hoerger (2010) calculated that for psychological studies, 10% of participants drop out almost instantaneously, with at least an additional 2% dropping out per 100 survey items. Thus, to reduce respondent fatigue (Lavrakas, 2008), short forms of measures were selected over longer forms. Online delivery also provided the participant with the flexibility to complete measures at any time, on any device. The completion rate for the questionnaire battery was high: 96% of students that started the questionnaires went on to complete all questions. Choice of instrumentation for the battery of tests was given careful consideration. For each construct of interest, relevant reviews, meta-analyses, and empirical studies that had measured that construct alongside EI and stress reactivity, were consulted (e.g., coping; O'Connor et al., 2017). Where possible, tools were preferable if they had been validated for use with adolescents. The following sections provide details of the instruments selected, with full copies available in **Appendix C.**

4.3.4.1 Emotional intelligence: trait

The Trait Emotional Intelligence Questionnaire - Adolescent Short Form (TEIQue-ASF) is an age-appropriate, short measure of TEI from the TEIQue family of measures (e.g., TEIQue, TEIQue-Short Form [TEIQue-SF], TEIQue-Adolescent Full Form [TEIQue-AFF]) (Petrides, 2009). Those measures are some of the few TEI measures that align with a clear theoretical framework (Siegling et al., 2015a; 2015b). Other instruments (e.g., Emotional Quotient Inventory [EQ-I]; Bar-On, 1997; SEIS; Schutte & Malouff, 1998) are restricted in their range and depth of coverage of the TEI domain (Parker et al., 2011; Pérez et al., 2005; Petrides, 2009). Further factors influencing the selection of the TEIQue-ASF for the present study include its widespread use, availability, and excellent psychometric properties of the TEIQue (Cooper & Petrides, 2010). Its popularity was also alluded to in a systematic review on EI in stress reactivity contexts (Lea et al., 2019). In the TEIQue-ASF, individuals indicate their level of agreement with a set of 30 brief statements using a 7-point Likert scale, with scale points ranging from ‘Completely disagree’ (1) to ‘Completely agree’ (7). From this, global scores and scores on four emotional self-perception factors; *emotionality*, *self-control*, *sociability*, and *well-being*, are derived (Petrides, 2009), where higher scores denote higher levels of TEI.

Table 3 displays descriptions of the factors and example items from the TEIQue-ASF. The TEIQue family of measures possesses excellent reliability which usually exceeds .80, and is generally considered superior to other common TEI measures, such as the Schutte Emotional Intelligence Scale (Gardner & Qualter, 2010). The TEIQue yields a robust factor

Table 3

Descriptions of Factors and Example Items from the Trait Emotional Intelligence Questionnaire - Adolescent Short Form (TEIQue-ASF)

Factor	Factor description	Example items	High scorers perceive themselves as…
Emotionality	Perceived abilities relating to *recognition* and *expression* of emotion in the self and others, necessary for development and maintenance of close personal *relationships*	I often find it hard to see things from someone else's point of view. (R) I pay a lot of attention to my feelings.	…clear about their own and other people's feelings …capable of communicating their feelings to others …capable of taking someone else's perspective
Self-control	Perceived ability to control *impulses* and cope under *pressure*	Sometimes, I get involved in things I later wish I could get out of. (R) I find it hard to control my feelings. (R)	…capable of controlling their emotions …reflective and less likely to give in to their urges …capable of withstanding pressure and regulating stress
Sociability	Perceived competencies relating to *communication* and *influence* within social contexts (e.g., negotiation, networking)	I'm good at getting along with my classmates. I can make other people feel better if I want to.	…capable of influencing other people's feelings …forthright, frank, and willing to stand up for their rights

			…accomplished networkers with excellent social skills
Well-being	Perceived *optimism*, *happiness*, and life *satisfaction*	I'm happy with the way I look.	…confident and likely to look on the "bright side of life"
		Sometimes, I think my whole life is going to be miserable. (R)	…cheerful and satisfied with their lives …successful and self-confident
Auxiliary factors	Items relating to *self-motivation* and *adaptability* which are not connected to the four above factors	I find it hard to keep myself motivated. (R)	…driven and unlikely to give up in the face of adversity
		I'm able to cope well in new environments.	…flexible and willing to adapt to new conditions

Note. Information sourced from Petrides (2009).

structure that retains its validity even in the brief versions (Cooper & Petrides, 2010), and has excellent reliability, indicated by Cronbach's alphas of .88-.92 and good item discrimination (Cooper & Petrides, 2010; Petrides, 2009). Although most validation work has been conducted with the adult TEIQue, psychometric properties of the TEIQue-ASF also appear convincing so far (Davis & Humphrey, 2014; Siegling et al., 2015b). Reliability scores were largely acceptable in the present study: .91 (global score), .91 (well-being), .70 (self-control), .70 (emotionality), and .61 (sociability).

4.3.4.2 Emotional intelligence: ability

The prevailing model of AEI proposes two areas of emotional cognition; *experiential* (perception of emotion; using emotion to facilitate thought) and *strategic* (understanding emotion; managing emotion) (Mayer et al., 2002). The present study focusses on the strategic branch due to its consistent link with mental health (e.g., suicidal behaviour; Cha & Nock, 2009) and stress-related variables (e.g., perceived life stress; Ruiz-Aranda, Extremera & Pineda-Galán, 2014; cardiac reactivity; Schneider et al., 2013). In terms of measurement, AEI is predominantly estimated using the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer et al., 2002). However, commentators argue that implementation of alternatives is required to fully differentiate test effects from construct effects in such a complex construct (MacCann & Roberts, 2008). Furthermore, as discussed in Chapter 2, the MSCEIT is costly, and lacks transparency due to its unorthodox scoring methods (Fiori et al., 2014). Newer, freely available assessments of EI: the vignette-based Situational Test of Emotional Understanding (STEU), and Situational Test of Emotional Management (STEM), were selected for the present study, both of which are freely available (MacCann & Roberts, 2008), and positively correlate with total and branch scores of the MSCEIT (Austin, 2010).

The STEM was constructed using the situational judgement test method (McDaniel, Morgeson, Finnegan, Campion & Braverman, 2001). In the STEM, participants select the optimum emotional management strategy to deal with either sadness, anger, or fear, across a diverse range of 44 scenarios. Item responses are assigned different weightings to represent degree of agreement with expert consensus opinion. In contrast, the STEU was developed according to Roseman's (2001) appraisal theory of emotions, which predicts the most plausible emotion to be felt in a situation based on specific combinations of seven appraisal dimensions, such as causal agency (other- vs. self- vs. circumstance-caused) and control potential (high vs. low). Participants identify which emotion (e.g., sadness, pride, regret, contempt, frustration, anger, fear) is most likely to be felt in 43 given situations, with the correct emotion scored according to Roseman's theoretical model. Vignette topics in both scales span the workplace, relationships, and personal life. Higher scores on the STEU and STEM represent greater capacities to understand and manage emotions, respectively. For more details of the STEU/STEM development, see the test authors' original paper (MacCann & Roberts, 2008), and **Table 4** for example items.

Despite their relatively recent development, psychometric properties of the STEU and STEM appear promising, with adequate reliabilities of .71 (STEU) and .68 (STEM) (MacCann & Roberts, 2008). For brevity, the current study employed the shorter versions of these measures; the STEU-Brief (STEU-B; 19 items) (Allen, Weissman, Hellwig, MacCann, & Roberts, 2014), and the STEM-Brief (STEM-B; 18 items) (Allen, Rahman, Weissman, MacCann, Lewis, & Roberts, 2015), reliabilities for which are mostly acceptable; .63 (STEU-B) and .84 (STEM-B) (Allen et al., 2014; 2015). With the exception of the MSCEIT-Youth version (only available commercially), no AEI measures have been validated with an adolescent population. Thus, the present study also served to validate the STEM-B and STEU-B with 16-

Table 4

Example Items from the Situational Test of Emotional Management- Brief (STEM-B) and Situational Test of Emotional Understanding- Brief (STEU-B)

Strategic AEI branch	Tool	Example items	Answers
Emotional Management	Situational Test of Emotional Management – Short Form (STEM-B)	Julie hasn't seen Ka for ages and looks forward to their weekend trip away. However, Ka has changed a lot and Julie finds that she is no longer an interesting companion. What action would be the most effective for Julie?	(a) Cancel the trip and go home. [.00] (b) Realise that it is time to give up the friendship and move on. [.00] (c) Understand that people change, so move on, but remember the good times. [.92] (d) Concentrate on her other, more rewarding friendships. [.08]
Emotional Understanding	Situational Test of Emotional Understanding – Short Form (STEU-B)	Xavier completes a difficult task on time and under budget. Xavier is most likely to feel?	(a) Surprise **(b) Pride** (c) Relief (d) Hope (e) Joy

Note: STEM: answer ratings shown in parentheses (determined by expert opinion); STEU: correct answer in bold (determined according to Roseman's theoretical model). From: Allen et al. (2014; 2015)

18 year olds. Cronbach alphas supported the suitability of the STEM-B (.67), but not the STEU-B (.38), for the population in question.

4.3.4.3 Personality

The Big Five Factor model (FFM), in which personality is conceptualised as five components (extraversion, agreeableness, conscientiousness, neuroticism, and openness), is generally considered the 'gold standard' personality model in psychology (McCrae & Costa, 2013). Personality was assessed using the mini International Personality Item Pool (mini-IPIP; Donnellan, Oswald, Baird, & Lucas, 2006), a freely available measure of the FFM, selected due to its efficiency in assessing broadband personality with relatively few (20) items. In the scale, participants indicate to what extent they agree with 20 brief statements prefaced with "I…" using a five-point scale from 'very inaccurate' (1) to 'very accurate' (5). Each trait is assessed through four items. Internal consistencies have been acceptable-good (.65 - .91) across multiple studies (e.g., Cooper, Smillie, & Corr, 2010), and, importantly, in a large nationally representative sample of 15,701 adolescents (Baldasaro, Shanahan, & Bauer, 2013). Those studies also demonstrated robust factor structure via confirmatory factor analyses. The mini IPIP has excellent convergent validity with longer FFM measures, such as the Big Five Inventory (BFI; John & Srivistava, 1999), and the full version of the IPIP (Donnellan et al., 2006). Descriptions of the five factors, along with example items from the IPIP, and Cronbach's α values for the present data, can be located in **Table 5**.

4.3.4.4 Cognitive ability

According to the traditional model of intelligence developed by Catell (1963), cognitive ability ('intelligence'; *g*) can be conceptualised as two broad factors: fluid intelligence (Gf; the ability to think logically and use problem solving in novel situations, independently of

Table 5

Descriptions of Factors, Alpha Reliabilities and Example Items from the Mini International Personality Item Pool (mini-IPIP)

Factor	Description	High scorers typically…	Example items ("I…")
Extraversion (α = .77)	Inclination to seek stimulation from the company of others (as opposed to solitude)	• Have lots of energy • Are likely to assert themselves • Are action-oriented	…am the life of the party. …don't talk a lot. (R)
Agreeableness (α = .80)	Disposition to show a pro-social approach (as opposed to antisocial); tendency to get on well with others	• Are well-liked • Show compromise and altruism	…am not really interested in others. (R) …sympathise with others' feelings.
Conscientiousness (α = .70)	Tendency to control impulses and display socially acceptable behaviour	• Are very organised and goal-oriented • Delay gratification	…like order. …get chores done right away.
Neuroticism (α = .82)	Propensity to experience negative feelings (e.g., anxiousness, sadness); emotional instability	• Are emotionally reactive • Show low levels of confidence and self-esteem	…have frequent mood swings. …am relaxed most of the time. (R)
Openness (α = .74)	Willingness to try new things; depth and complexity of experiences	• Think outside the box • Prefer variety • Are creative and innovative	…have a vivid imagination. …am not interested in abstract ideas. (R)

Source: John & Srivastava (1999); Donnellan et al. (2006).

acquired knowledge) and crystallised intelligence (Gc; the ability to use acquired skills, knowledge, and experience, to solve problems). Although other types of intellectual functioning (e.g., visual perception; auditory perception) have been explored, Gf and Gc still remain the central components of contemporary models. Since evidence generally suggests that EI is more closely related to Gc than Gf (e.g., Farrelly & Austin, 2007), a measure of Gc was employed in the present study. In addition, controlling for word knowledge ensures that higher scores on the adult AEI measures do not simply reflect superior comprehension. Objective, standardised measures of *g* are preferred over commonly utilised proxy measures of intelligence (e.g., academic achievement), which can be the consequence of multiple factors (Rossen & Kranzler, 2009). Thus, Gc was indexed in the current study using an 18-item Vocabulary tests from the Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, Harman, & Dermen, 1976). Participants read the list of words (e.g., implicate, feline, airtight) and choose alternatives that are closest in meaning. The test battery has been well-validated (for example: Salthouse, 2014), and is quick to administer. In the present study, participants scored an average of 61.11% (*SD* = 16.36), with an internal consistency of .64. As discussed in Chapter 2, few freely available tasks and measures are specifically designed for older adolescents. Despite being designed for participants aged over 18 years, several tests in the Kit of Factor-Referenced Cognitive Tests (Ekstrom et al., 1976) have been successfully used with adolescents (e.g., 16-25 years; Berger, van Spaendonck, Horstink, Buytenhuijs, Lammers, & Cools, 1993), including the vocabulary test used in the present study (12-15 years; MacCann & Roberts, 2013; 15-19 years; Diehl, Coyle, & Labouvie-Vief, 1996).

4.3.4.5 Mental health

Adolescents' mental health was assessed using the Hospital Anxiety Depression Scale (HADS; Zigmond & Snaith, 1983), which focusses on two scales: anxiety and depression (7 items each). In the HADS, participants read statements and choose the response that most closely resembles how they have been feeling over the past week. For example, 'Worrying thoughts go through my mind' (response options: 'A great deal of the time', 'a lot of the time', 'from time to time but not too often', 'only occasionally'). The HADS is an established tool in both research and practice, and is recommended by the National Institute for Health and Care Excellence (NICE; 2020). Although clinical diagnoses were not required for the present research, the measure provides an indication of levels of trait anxiety and depression that could influence the variables of interest. Compared with healthy individuals, those experiencing high levels of anxiety and depression often show dysregulated stress reactivity and recovery (Burke et al., 2005; de Rooij et al., 2010). Importantly, the HADS has been validated for use with older adolescents (Chan, Leung, Fong, Leung, & Lee, 2010; Jörngården, Wettergen, & Essen, 2006) and has typically good psychometric properties with Cronbach alphas exceeding .70 in most cases. The present study yielded Cronbach alpha coefficients of .88 overall, .84 for the Anxiety scale and .81 for the Depression scale.

4.3.5 Stress manipulation procedure

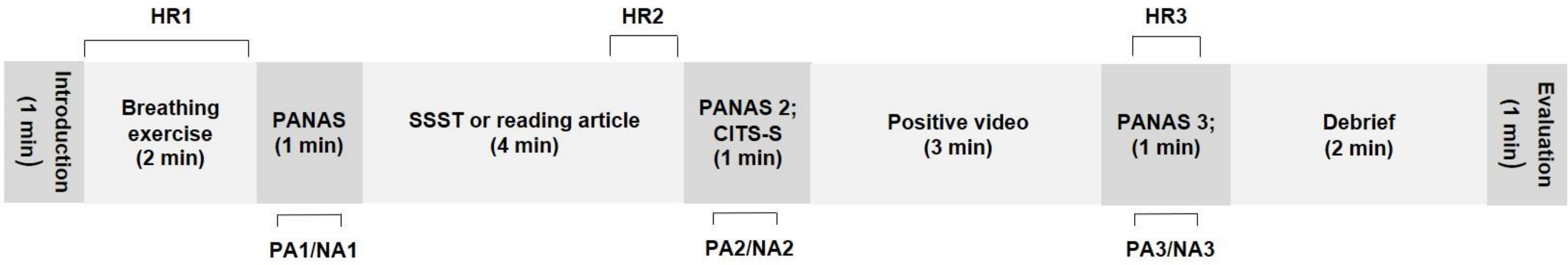
To induce stress, the experiment employed a variant of the Sing-a-Song Stress Test (SSST), a relatively novel, but effective, means of inducing acute stress (Brouwer & Högervorst, 2014). The SSST significantly induces both physiological and perceived stress (Brouwer & Högervorst, 2014), and presents practical utility, and a greater suitability for the target participants, over other tests such as the Trier Social Stress Test (Kirschbaum, Pirke &

Hellhammer, 1993). **Appendix A** provides detailed justifications for selection of the SSST as a stress inducer, and indices of stress, for the present study.

The SSST was presented as a PowerPoint slideshow (**Appendix D**), with the researcher observing the participant and offering verbal clarifications when necessary. To establish baseline physiology, the first screen instructs the participant to relax and take deep breaths for two minutes. The participant then engages with four simple, nonverbal, non-emotive cognitive tasks (e.g., "Think of as many animals as you can beginning with the letter 'p'"), interchanged by a counter counting down from 30 seconds to zero. Next, the (stress-inducing) screen informs participants that they are required to sing a song of their choice at the end of the countdown (60 seconds to 0), and that the performance will be recorded. When the counter reaches zero, participants sing their song for 60 seconds (see **Figure 7**). It is during that last 60 seconds (i.e., while the participants are singing) for which stress reactivity is derived (see 'Stress operationalisation' section). In the control conditions, participants completed the same breathing exercise before reading a non-emotive magazine article and completing a readability questionnaire, for which participants were assured there were no right or wrong answers (see **Appendix E**). The control task had a similar cognitive load, but to attenuate the social-evaluative threat, the researcher was supportive and there was no pretence of audio-visual recording. The reading task was shown to be an appropriate control task by Davis (2018b); the task produces no discernible increase in stress.

Figure 7

Visual Representation of the Experimental Procedure with Approximate Timeline



Note. HR = heart rate; HR1 represents HR at time-point 1 (baseline), HR2 = HR at time point-2 (reactivity); HR3 = HR at time-point 3 (recovery); CITS-S = Coping Inventory for Task-Based Stressors – Situational version; PANAS = Positive Negative Affect Schedule; SSST = Sing-a-Song Stress Test.

4.3.6 Stress responses

4.3.6.1 Psychological reactivity

Physiological changes following a stressful stimulus are accompanied by changes in subjective experience (Levenson, 2014). Subjective mood was estimated using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988; see **Appendix C**), the most commonly used mood tool identified in the systematic review of the EI and stress reactivity literature. The scale assesses two broad and independent dimensions: positive affect (PA), and negative affect (NA). In the 'present moment' PANAS, participants rate to what extent they are experiencing 20 adjectives (e.g., 'nervous', 'determined', 'upset') on a five-point Likert scale from 'Very slightly or not at all' (1) to 'Extremely' (5). Each scale contains ten items, with the summed scores for the items on each scale indicating the participant's current level of PA and NA. The PANAS possesses excellent psychometric properties (Crawford & Henry, 2004; Tuccitto, Giacobbi, & Leite, 2010), reliably capturing transient, state-dependent variations in stress, and converging with similar measures such as the Profile of Mood States (POMS) and State-Trait Anxiety Inventory (STAI) (Rossi & Pourtois, 2012). Although some literature challenges its cross-cultural applicability (Villodas, Villodas, & Roesch, 2011), the PANAS has been validated with the age range in question, returning acceptable internal consistency scores of .80-86 in English-speaking populations (Crocker, 1997; Huebner & Dew, 1995). In the present study, alpha reliabilities were excellent for both NA (.80-.92) and PA (.80-.87) scales.

4.3.6.2 Physiological reactivity

Previous studies exploring the relationship between EI and physiological stress reactivity commonly utilise cardiac variables (including HR) as an index of autonomic nervous system

(ANS) activity (Lea et al., 2019). Therefore, throughout the experimental session, participants wore a Fitbit Charge 2, a wrist-worn optical blood sensor (Fitbit, US) that employs PurePulse© optical HR technology to automatically measure HR once every second. Whereas some evidence suggests that Fitbit technology may not adequately capture HR during *free-living* conditions, when compared to 'gold standard' chest straps (Lee, An, Kang, & Kim, 2016), preliminary evidence indicates that reliability is very good in an experimental setting when participants are seated (i.e., the conditions of the present study) (Shcherbina et al., 2017). In addition, the age of the participants (under 18 years) and the nature of the experiment (stress induction) also supported the equipment selection; the device is unlikely to cause any additional stress to participants due to its familiarity with young people, and its non-invasiveness, when compared to other laboratory equipment (e.g., chest straps).

4.3.6.3 Stress operationalisation

Stress was operationalised via both objective (physiological; HR) and subjective (psychological; mood) means (see above sections). The approach to operationalisation of stress reactivity and recovery variables, and selected time-points, was akin to similar studies examining the role of EI and cardiac reactivity (e.g., Ling et al., 2018; Liu, Vickers, Reed, & Hadad, 2017; Pittarello, Conte, Caserotti, Scrimin, & Rubaltelli, 2018). Level of stress was captured across the experiment at three time-points: at baseline (**PA1, NA1, HR1**), during the stressor (**PA2, NA2, HR2**), and during recovery (**PA3, NA3, HR3**) (see **Table 6** for descriptions of variables, and **Figure 7** for experiment context).

Table 6

Descriptions of Stress Variables Captured Across the Experiment

Stress variable	Description/source
Baseline HR **[HR1**]	Mean HR during 120s breathing exercise
HR during stress task [**HR2**]	Average HR across 60s of singing
HR following positive video [**HR3**]	Mean HR across 60s following positive video viewing
Baseline mood [**PA1/NA1**]	PANAS1 completed at baseline
Mood during stressor [**PA2/NA2**]	PANAS2 completed retrospectively
Mood after positive video [**PA3/NA3**]	PANAS3 completed following positive video viewing

Note: HR = heart rate; PA = positive affect; NA = negative affect. Time-points for capturing stress indices were matched in the control group.

Operationalisations of stress reactivity and recovery were subsequently calculated from these indices. Psychological stress reactivity was calculated by subtracting mood at baseline (PA1/NA1) from mood during stressful task (PA2/NA2) (i.e., stress reactivity = **PA2 – PA1**; **NA2 – NA1**). Physiological stress recovery was operationalised as the change in mood from during the stressor (PA2/NA2), to following the positive video (PA3/NA3) (i.e., **PA3 – PA2; NA3 – NA2**), with baseline PA/NA included as covariates. Calculations for physiological variables was similar, but used % changes instead of raw values (PA/NA scores are standardised, whereas HR is not). Physiological stress reactivity was operationalised as the % change from the average HR during the 2-minute relaxation exercise (baseline; HR1) to the average HR during the singing task (HR2) (i.e., stress reactivity = **HR2** – **HR1**). Recovery was operationalised as the % change from the average HR during the singing (HR2) to the average HR during the minute following the presentation of a positive video (HR3) (i.e., stress recovery = **HR3** – **HR2**), with HR1 included as a covariate (to control for the individual's resting HR). The experimental context for which these variables were applied is described in the 'Procedure' section.

4.3.6.4 Coping.

In addition to investigating EI in relation to response modulation (i.e., psychological and physiological stress reactivity), the present study also endeavoured to investigate EI's role in relation to situational coping (**H3; H4**), part of the 'cognitive change' family of ER strategies (Gross, 1998a). Whilst there is little consensus on how best to conceptualise and measure coping (especially in childhood and adolescence; Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001), it is generally agreed that coping is a complex, multidimensional construct. Many coping measures have been developed that attempt to converge different theoretical approaches, such as task-focussed coping vs. emotion focussed coping, and approach vs. avoidance distinctions, resulting in a plethora of taxonomies and inventories of coping strategies (for review, see Kato, 2013). For example, Skinner et al. (2003) analysed the structure of coping category systems and identified 15 different higher order distinctions from 100 coping measures. One of the most common coping strategy categorisations is that comprising task-focussed coping vs. emotion-focussed coping vs. avoidance coping, upon which many self-report coping inventories have been devised (e.g., Endler & Parker, 1999).

The Coping Inventory for Task Stressors (CITS; Matthews & Campbell, 1998) is a self-report, multidimensional measure of explicit coping styles used to complete a stressful task. The CITS-S (CITS - situational version) consists of 21 items that form three scales: *task-focussed* coping, *emotion-focussed* coping, and *avoidance* coping. Participants indicate the extent to which they utilised each of the strategies during the task they have just performed, using a 5-point scale from 'not at all' (0) to 'extremely' (4). **Table 7** provides a description and example items for each of the three dimensions. The CITS-S is particularly well-suited for the present study as it is specifically designed for a *task*-based stressor, in contrast to more generic coping instruments (such as the widely used COPE; Carver, Scheier, & Weintraub, 1989), which contain items irrelevant to laboratory-based situational stressors (e.g., '*I discuss my feelings with someone'*). The CIT-S has demonstrated good internal reliability of between .79 and .91 with adolescent populations (Matthews & Campbell, 1998; Matthews et al., 2006; O'Connor et al., 2017), and, furthermore, the CITS has been recently employed alongside the present study's measure of TEI, the TEIQue-SF (O'Connor et al., 2017). The CITS-S was also shown to be reliable in the present study: task-focussed coping: .75, emotion-focussed coping: .90, avoidance coping: .73). The full CITS-S is included in **Appendix C**.

Table 7

Descriptions and Example Items for the Coping Inventory for Task-Based Stressors (Situational Version) (CITS-S)

Coping dimension	Description	Example item "I…"
Task-focussed	Practical strategies that focus on performance and tackle the stressor directly	…Was careful to avoid mistakes. …Did my best to follow instructions for the task.
Emotion-focussed	Maladaptive strategies that utilise negative emotions (e.g.,	…Wished that I could change what was happening.

	worry, self-blame) to cope with stress	…Blamed myself for becoming too emotional.
Avoidance-focussed	Strategies characterised by efforts to avoid or "escape" the stressor	…Stayed detached or distanced from the situation. …Didn't take the task too seriously.

4.3.7 Procedure

In the participating college, the researcher visited eight AS and A level[1] Psychology classes to give talks that lasted approximately 15 minutes. During this time, the researcher introduced herself to the students, gave a brief PowerPoint presentation that highlighted the benefits and risks of participating in research, and provided a brief outline of the study. Information packs containing an information sheet, letter to parents, and consent form, were then handed out (see **Appendix F**). These talks were arranged by liaising directly with Psychology teachers, and usually took place at the end of timetabled lessons. Individual student involvement was contingent upon the return of the opt-in consent form (co-signed by both the student and their parent/guardian). Participants indicated their email address on their consent form; the information sheet reassured them that they would only be contacted for the purposes of recruitment and arranging timeslots. Email addresses were stored in a spreadsheet on the researcher's password-protected laptop and were not included in datasets containing responses, to preserve anonymity. The study was composed of two parts: an online questionnaire battery, and an in-person experimental session. Within one week after written consent was obtained, participants received an email containing an individual link to the online portion of the study, where the TEIQue-ASF, STEM-B, STEU-B,

[1] AS and A levels are subject-specific qualifications taken by students aged 16-18 years in the UK (except Scotland)

mini IPIP, HADS, and the vocabulary test, were completed (all hosted on esurveycreator.co.uk). Biological sex and age data were also collected. Order effects were controlled for by counterbalancing the order of measures across the sample (Lavrakas, 2008). Participants could stop and resume the online portion of the study at any point over 10 days. Throughout this time, two email reminders were sent out to participants who had not completed all questions. The battery took approximately 25 minutes to complete.

Approximately two weeks after completion of the online questionnaires, participants were sent an email with a link to a Doodle Poll web page to select a convenient time slot (outside teaching blocks) for the in-person experimental session. Of the 74 students that completed the questionnaires, 58 also completed an in-person experimental session (in terms of the drop-outs, 15 participants did not book a time-slot for the experiment, and 1 participant withdrew due to illness). Data collection for the experiment took place in unused classrooms within the college. Prior to meeting, participants were randomly assigned to either the stressful or control condition. Participants were aware they may have to perform a task as part of the experiment, but the nature of the task was unknown to them. Upon arrival, participants were verbally assured regarding confidentiality and their right to withdraw. After putting on the Fitbit Charge 2 wristband (Fitbit, US), those in the stress condition underwent the SSST, whereas the control group read the neutral magazine article. Subjective mood (and time-matched HR index) was captured at three time points: at the start of the experiment (baseline), immediately after the stressful task or control task (reactivity), and approximately five minutes after the task (recovery) (**Figure 7**). Time-points were based on those used in similar studies (e.g., Ling et al., 2018; Liu et al., 2017; Pittarello et al., 2018) **(Table 6**). Although no adverse reactions were experienced, the researcher always had a first point of contact within the college with whom to consult in case of student well-being issues. After the intermediate mood assessment, participants completed the coping measure and watched a short comedic video of puppies to reduce remaining stress and repair mood, a similar technique akin to that used by Verheyen and Göritz (2009), before completing the third and final mood measure. Afterwards, a verbal debrief was provided, which included signposting to sources of emotional support. To maintain study integrity, it was requested that participants not share the details of the experiment with other participants. Participants also had the option of completing an anonymous evaluation of the study, all of whom obliged (**Appendix G**). Results from the evaluation were informally used to assist with the design of participant recruitment strategies for subsequent studies. Finally, participants were thanked for their participation and reminded to contact the researcher should they have questions or wish to withdraw their data. The experimental session lasted approximately 20 minutes. See **Figure 7** for a visual representation of the experiment timeline. Data collection was conducted between October and December 2017.

4.4 Results

4.4.1 Analysis plan

To check the stress induction procedure was successful, two 2 (condition: stressful vs. control) x 2 (time: before and during task) repeated measures ANOVAs were performed for NA and HR (Mikolajczak et al., 2009a) (see **Table 6** for calculations of stress variables used in analyses). The analytic strategy for the reactivity analyses (i.e., **H1**, **H2**, and **H3**) was based upon that described by Matthews et al. (2006). Separate hierarchical regressions were performed, with either NA, PA, HR, or coping strategy family, as criterion. The first two successive steps entered were baseline state (e.g., NA1), and the dummy vectors for task condition. The third step entered the Big Five personality traits, cognitive ability, trait anxiety, and trait depression[2], along with their product vectors representing conditional effects (e.g., neuroticism x task condition). EI (e.g., TEI; AEI) was entered for the fourth step. For the fifth and final step, the product vectors representing EI x task condition were entered. All predictors were centred around their mean, as per Hayes' (2018, p. 524) suggestion for analyses where the main effects *and* interaction effects are of interest (i.e., EI *and* EI x experimental condition). Separate models were constructed for TEI and AEI, to avoid masking their individual incremental contributions towards the study outcomes.

To test **H4**, moderated mediation analyses were used to test coping strategies as mediators in the EI-reactivity relationship, and whether this was moderated by experiment condition, akin to MacCann et al. (2011) and Matthews et al. (2006). These were constructed and tested using the freely available PROCESS macro for SPSS (Model 8; Hayes, 2018). Although structural equation modelling (SEM) would have allowed for a parsimonious approach to the testing of a network of relationships between variables, SEM guidance typically recommends a minimum of 200-300 participants (e.g., Kline, 2011; Kyriazos, 2018; Tabachnick & Fidell, 2014). Conducting SEM analyses with the achieved sample size (n = 58 completed all aspects of the study) would risk producing an unreliable/improper solution (Kyriazos, 2018), and the inappropriate use of SEM in

[2] It is important to note that indices of mental health (i.e., anxiety and depression) were included as covariates in the study, rather than used as outcomes. Compared with healthy individuals, individuals with high levels of anxiety and depression often show dysregulated stress reactivity and recovery (Burke et al., 2005; de Rooij et al., 2010). Thus, there was a risk that individual differences in stress responses could be attributed to mental health conditions, rather than EI. Thus, while EI scores often correlate with better mental health and well-being (e.g., Fernández-Berrocal et al., 2007), the purpose of controlling for anxiety and depression was to ensure that clinical factors were limited in their capacity to influence the variables of interest.

psychological studies is a growing problem (e.g., Karimi & Meyer, 2014). For all analyses, a decision was also made to *not* adjust *p* values, despite analyses being repeated for each TEI subfactor. While the Bonferroni correction (and other correction solutions) reduce the risk of Type I errors when running multiple analyses with the same dependent variable (Field, 2017), that approach was deemed inappropriate in the present study for a number of reasons. First, subfactor analyses were exploratory and, secondly, were not explicitly linked to the study hypotheses, and, third, employing *p* value adjustments may instead mask effects (increasing Type II errors) by drastically reducing statistical power (Cabin & Mitchell, 2000; Gelman, Hill & Yajima, 2012; Nakagawa, 2004; Streiner & Norman, 2011).

4.4.2 Data screening and preparation

Of the 83 students that consented to take part in the study, 71 students finished the battery of questionnaires, 58 of whom also completed an experimental session. The 13 participants that completed the online questionnaire battery and 58 participants that completed the entire study did not differ systematically in terms of TEI, AEI, personality, cognitive ability, or mental health (independent samples *t*-tests for completions vs. non-completions all showed *p*s > .05). There were also no discernible differences in age or biological sex composition (*p*s > .05). The dataset for those 58 participants was complete with the exception of HR responses for three participants (the small wrist size of those three participants meant that the device was not close enough to the skin to capture HR, even on the tightest setting), data for whom was subsequently used on a pairwise basis. Preliminary analysis of the dependent variables highlighted three univariate outliers (but no multivariate outliers) that were detached from the distribution with z-scores ± 3.29 *SD* from the mean. To prevent incurring loss of statistical power by removing cases, the outlier values were instead replaced with the next highest value in the dataset (Tabachnick & Fidell, 2014), the approach recommended for biomarker data (Looney & Hagan, 2015).

4.4.3 Preliminary analyses

In line with guidance for experimental studies, normality analyses were conducted for each experimental group separately (Field, 2017). Data showed no evidence of non-normality, indicated by 1) skewness and kurtosis statistics (scores divided by their SE were smaller than ± 1.96), 2) significant Shapiro-Wilk tests (*p*s > .05), and 3) visual inspection of histograms. All other assumptions for hierarchical regression (e.g., independence of errors, equal error variances, homogeneity of variance) were met (Field, 2017). Multicolinearity was minimised through the use of mean-centred variables. Whole-sample statistics (including means, standard deviation, range, reliability indices, skew, and kurtosis) for the online measures are provided in **Table 8**. Reliability analyses highlighted the STEU-B as a highly unreliable measure of emotional understanding for the participant group, demonstrated by an unacceptable level of internal consistency (α = .38) that was not attributable to any single item (Field, 2017). Others have encountered similar issues regarding the low internal reliability of the STEU, though with values still considerably higher than in the present study (α = .48; Austin et al., 2010). Thus, main analyses using the STEU-B are not reported or interpreted as the measure does not adequately capture the construct of interest (i.e., emotional understanding) in young people.

For the purposes of experimental control, it was necessary to identify any pre-existing differences between experimental groups in terms of demographics (age, sex) and the study variables of interest. Randomly allocated mood groups did not differ in: age ($\chi(2)$ = 1.33, *p* = 511), sex ($\chi(2)$ = .01, *p* = .490), trait EI ($t(56)$ = -2.0, *p* = .84), Emotional

Table 8

Correlations and Whole-Sample Descriptive Statistics for EI, Personality, Mental Health and Cognitive Ability (N = 71)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	**.78*****	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	**.81*****	**.46*****	-	-	-	-	-	-	-	-	-	-	-	-	-
4. TEI: SO	**.72*****	**.51*****	**.48*****	-	-	-	-	-	-	-	-	-	-	-	-
5. TEI: WB	**.89*****	**.57*****	**.70*****	**.53*****	-	-	-	-	-	-	-	-	-	-	-
6. AEI: EU	.23	**.40****	.12	.07	.14	-	-	-	-	-	-	-	-	-	-
7. AEI: EM	**.33****	**.43*****	**.28***	.07	**.23***	**.51*****	-	-	-	-	-	-	-	-	-
8. O	-.12	-.19	-.03	.06	-.15	.00	-.13	-	-	-	-	-	-	-	-
9. C	**.52*****	**.49*****	**.36****	**.35****	**.42*****	.09	.09	-.16	-	-	-	-	-	-	-
10. E	**.43*****	.29*	.23	**.43*****	**.39****	-.12	.08	-.16	.21	-	-	-	-	-	-
11. A	**.31****	**.53*****	.10	**.25***	.11	**.31****	**.31****	-.09	**.32****	.04	-	-	-	-	-
12. N	**-.71*****	**-3.67****	**-.73*****	**-.51*****	**-.67*****	-.03	-.17	-.00	-.19	**-.29***	.01	-	-	-	-
13. ANX	**-.68*****	**-.42*****	**-.60*****	**-.59*****	**-.57*****	-.17	**-.24***	.06	**-.28***	**-.31****	-.10	**.77*****	-	-	-
14. DEP	**-.69*****	**-.48*****	**-.57*****	**-.44*****	**-.71*****	-.21	-.22	**.24***	**-.33****	**-.34****	-.18	**.55*****	**.58*****	-	-
15. GC	.11	.04	.23	.02	.07	**.26***	.18	.21	.04	**-.25***	.06	-.20	-.18	-.03	-
M	4.42	4.74	3.90	4.92	4.33	11.70	10.14	14.56	12.73	12.14	16.55	13.72	10.03	4.56	10.88
(*SD*)	(0.90)	(0.91)	(1.07)	(0.86)	(1.53)	(2.14)	(2.29)	(2.83)	(3.34)	(3.48)	(2.83)	(3.84)	(4.77)	(3.96)	(16.71)
Range	2.27 –	2.63 –	1.67 –	2.17 –	1.00 –	7.00 –	3.33 –	7.00 –	5.00 –	4.00 –	8.00 –	4.00 –	0.00 –	0.00 –	5.00 –
	6.67	6.75	6.33	7.00	7.00	16.00	14.42	20.00	20.00	19.00	20.00	20.00	20.00	18.00	18.00
Skew	-.27	-.08	.088	-1.03	-.40	.07	-.70	-.36	.21	-.27	-.88	-.45	-.03	1.41	.35
Kurtosis	-.02	-.44	-.45	1.71	-.76	-.30	.30	.60	-.34	-.43	.42	-.44	-.60	2.08	-.46
α	0.91	0.70	0.70	0.61	0.91	0.38	0.67	0.74	0.70	0.77	0.80	0.82	0.84	0.81	0.64

Notes. TEI = Trait emotional intelligence; EM = Emotionality; SC = Self-control; SO = Sociability; WB = Wellbeing; AEI = Ability emotional intelligence; AEI: EU = Emotional understanding; AEI: EM = Emotional management; O = Openness; C = Conscientiousness; E = Extraversion; A = Agreeableness; N = Neuroticism; ANX = Trait anxiety; DEP = Trait depression; GC = Crystallised intelligence; *M* = mean, SD = standard deviation, α = Cronbach's alpha coefficient. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Management ($t(56) = .12$, $p = .912$), Big Five factor scores (*t*s < , .28, *p*s <.05), cognitive ability ($t(56) = -.27$, $p = .795$), or trait depression ($t(56) = -1.47$, $p = .154$). For reasons that are unclear, trait anxiety ($t(56) = -2.10$, $p = .043$) did differ. Participants later assigned to the control group reported higher levels of trait anxiety in the questionnaire battery ($M = 11.89$, $SD = 4.74$) than those assigned to the experimental group ($M = 9.40$, $SD = 4.29$). However, since preliminary analyses indicated that trait anxiety had no direct influence on any of the dependent variables (*p*s >.05), this anomaly is unlikely to have distorted the study findings.

Descriptive statistics for coping styles across experimental groups is shown in **Table 9.** The use of coping strategies differed between the experimental conditions. *T*-tests indicated that task-focussed and emotion-focussed coping strategies were used more for the control task (compared to the more stressful task), whereas the reverse pattern was shown for avoidant coping strategies (**Table 9**). In general, participants reported using task-focussed and emotion-focussed to a similar extent, and avoidant strategies the least. Preliminary exploratory analyses were conducted to investigate relationships between coping indices and stress outcomes (data not shown). The only significant findings were: (1) maladaptive emotion-focussed coping predicted greater NA deterioration, for the stress group only, and (2) avoidant coping predicted impaired NA recovery across both groups.

Table 9

Means and Standard Deviations of Coping Styles as a Function of Experimental Condition

	Stress		Control		
	M	*SD*	*M*	*SD*	*t*-test
Task-focussed	13.80	3.65	17.96	4.59	-3.84***
Emotion-focussed	13.60	7.27	17.43	6.98	-.204*
Avoidant	11.53	4.69	8.54	4.69	2.12*

Note. *M* = mean; *SD* = standard deviation. Stress ($n = 30$), Control ($n = 28$); * = $p < .05$, ** = $p < .01$, *** = p <.001.

4.4.4 Relationships between study variables

Table 8 displays whole-sample descriptive statistics and bivariate intercorrelations for the questionnaire battery variables (TEI, AEI, personality dimensions, cognitive ability, depression, anxiety). As expected, all were related to at least one TEI or AEI scale (or subscale). With respect to mental health, TEI and all component subscales were associated with lower levels of anxiety and depression (*r*s = -.41 to -71, *p*s < .01), and AEI (EM) also correlated with lower anxiety levels (r = -.24, p = .042), and depression (r = 0.22, p = .062), consistent with the large body of literature linking EI to psychological adaptation. Scores for any of the questionnaire variables did not significantly differ between males and females (*p*s >.05), with the exception of trait neuroticism ($t(67) = -3.02$, p = .004), whereby females showed higher levels (M = 14.26, SD = 3.71) than males (M = 10.75, SD = 3.39), a prevalent finding in the literature (Schmitt, Realo, Voracek & Allik, 2008). Main analyses (i.e., for reactivity and recovery) were not conducted separately for males and females due to the relatively small number of male participants (n = 8; 13.8% of sample), in light of literature suggesting that unequally sized groups can lead to unequal variances, general loss of power, and Type I error rates (Rusticus & Lovato, 2014).

Global TEI, and its emotionality and self-control subfactors, were positively associated with Emotional Management (**Table 8**). In response to the above analyses, subsequent main analyses controlled for the effects of sex, personality, cognitive ability, and mental health, as a precautionary measure. Baseline mood and physiology (i.e., PA1, NA1, HR1) were also controlled for when performing reactivity analyses. Correlations and whole-sample descriptive statistics for EI and all stress outcomes (for stressful and control conditions) can be located in **Appendix H.**

As anticipated, subjective (NA) and objective (HR) measures of stress did not significantly correlate (Campbell & Ehlert, 2012). Moderator analyses were conducted to test whether EI moderated the relationship between NA and HR during the task. For this, hierarchical multiple regressions were run to assess the increase in variation explained by the addition of an interaction term between NA and EI to a main effects model. Neither TEI ($F(1, 51) = 2.25$, $p = .144$) nor AEI ($F(1, 51) = .14$, $p = .712$) moderated the relationship between self-reported NA and HR during the task. In other words, the disparity between participants' emotional and physiological responses was not dependent on EI, consistent with findings elsewhere (Mikolajczak et al., 2007).

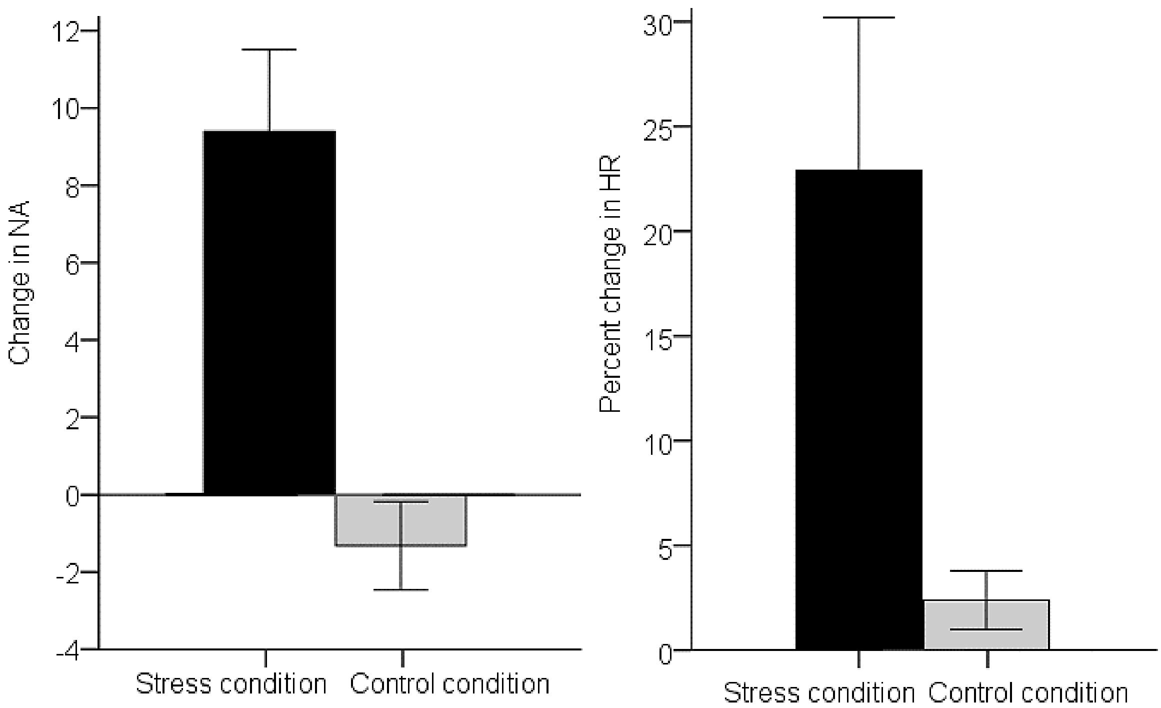
4.4.5 Stress manipulation check

In line with similar work, 2 (condition: stressful vs. control) X 2 (time: before and during task) repeated measures ANOVAs were performed on NA and HR to examine the success of the stress induction procedure (e.g., Mikolajczak et al., 2009a; 2009b) (**Figure 8**). Turning first to NA, results indicated a main effect of time, whereby NA2 was higher than NA1 ($F(1, 56) = 43.48$, $p < .001$, $n^2_{partial} = .44$) and a main effect of condition ($F(1, 56) = 36.75$, $p < .001$, $n^2_{partial} = .40$), where the mean level of NA was globally higher in the stress condition (M = 19.97, SD = .82) than the neutral condition (M = 12.80, SD = .85). There was also a significant time X condition interaction ($F(1,56) = 74.56$, $p < .001$, $n^2_{partial} = .58$). Post-hoc paired *t* tests confirmed that participants in the stress condition underwent a large increase in NA (M = 24.67, SD = 7.77) from baseline (M = 15.27, SD = 5.09) ($t(1, 29) = -8.90$, $p < .001$). In contrast, NA decreased over the course of the experiment for control group participants (M_{T1} = 13.46, SD = 2.25; M_{T2}= 12.14, SD = .55) ($t(1, 27) = 2.32$, $p = .033$), perhaps indicating that they felt more relaxed after their arrival (Mikolajczak et al., 2007).

In terms of HR, results indicated a main effect of time ($F(1, 53) = 47.66$, $p < .001$, $n^2_{partial} = .47$), demonstrated by an increase from HR1 (M = 77.78 bpm, SD = 14.98) to HR2 (M = 86.49 bpm, SD = 15.67), but no main effect of condition. A significant time x condition interaction emerged, however ($F(1,53) = 47.66$, $p < .001$). Post-hoc tests revealed that HR increased significantly for participants in both the stress condition (M_{T1} = 72.52 bpm, SD = 10.10; M_{T2} = 88.49 bpm, SD = 14.95; $t(1,26) = -6.25$, $p < .001$) and for the control condition (M_{T1} = 82.86 bpm, SD = 17.21; M_{T2} = 84.56 bpm, SD = 16.37; $t(1, 27) = -3.35$, $p = .002$). HR increases for the stress condition were comparable to the increase observed in the

Figure 8

Bar Graph showing Changes in Stress Levels During the Stress Induction Procedure



Notes. The figure illustrates the mean change in NA (absolute values) and HR (as % change) between T1 (baseline) and T2 (task) for each experimental condition. Error bars represent 2 ± standard errors. NA = negative affect; HR = heart rate.

TSST (17 bpm; Kirschbaum et al., 1993). However, the *magnitude* of the increase differed significantly between the conditions ($F(1,53) = 39.88$, $p < .001$): the increase was almost 10 times greater for the stress group ($M = 15.97$ bpm; $SD = 13.27$; 22.03% change) than the control group ($M = 1.70$ bpm; $SD = 2.69$; 2.39% change). Taken alongside the NA analyses, the marginal mean HR increase (less than 2 bpm) in the control group could be attributed to factors unrelated to stress (i.e., engagement, excitement, concentration) that can occur during the completion of any cognitive task (Wood, Maraj, Lee, & Reyes, 2002).

In essence, the stressor was highly effective, evidenced by substantial increases in both physiological and perceived stress in the stress group, compared to the control group. It is also noteworthy that the positive video shown after the stressor was successful in promoting mood repair: watching the video produced (1) significant increases in PA for both the experimental ($M = 5.90$, $SD = 6.46$; $t(1,29) = 5.01$, $p < .001$) and control groups ($M = 2.71$; $SD = 5.45$; $t(1,27) = 2.64$, $p = .014$), and (2) significant decreases in NA for both the experimental ($M = -12.23$, $SD = 7.04$; $t(1,29) = 9.54$, $p = .001$) and control groups ($M = -1.64$; $SD = 2.31$; $t(1,27) = 3.76$, $p < .001$).

H1: TEI will predict reduced psychological and physiological reactivity under stressful conditions

4.4.6 Effects of EI on stress reactivity

4.4.6.1 TEI and stress reactivity

Separate hierarchical regressions were conducted to determine if TEI improved the prediction of NA, PA, or HR reactivity, after controlling for confounding variables. For all three models, baseline variables (step 1), and experimental condition (step 2) predicted all outcomes, as expected. To avoid repetition of the mood manipulation analysis, findings relating to these initial two steps are not reported for the remainder of the results section. For the prediction of **NA**, the addition of the covariates did not significantly improve the model at step 3 (ΔR^2 = .08, p = .522). The addition of global TEI (ΔR^2 = .002, p = .511) and TEI x condition (Model 5: ΔR^2 = .001, p = .672) also failed to significantly increase R^2. Similarly, at step 3 of the **PA** model, the addition of covariates did not significantly improve the model (ΔR^2 = .21, p = .215). Furthermore, adding in TEI at step 4 (ΔR^2 = .003, p = .626), and the TEI product vector at step 5 also produced no significant effects (ΔR^2 = .008, p = .447).

A different picture emerged for physiological stress (**HR** reactivity). Entering the covariates at step 3 significantly improved the model fit (ΔR^2 = .008, F(12, 40) = 9.98, p = .008, adjusted R^2 = .67). While the addition of TEI at step 4 did not have a significant effect (ΔR^2 = .006, p = .31), the TEI x condition at step 5 significantly increased R^2 (ΔR^2 = .026, F(1, 38) = 8.98, p = .036, adjusted R^2 = .71). At that fifth and final step, several factors remained significant predictors, including TEI (β = -1.168, p = .021), which predicted *smaller* HR responses overall. There were also significant conditional predictors, with directional effects identified through post-hoc testing. TEI (β = .855, p = .036) predicted smaller HR responses in the stress condition, but had no effect in the control condition. Findings for the reactivity analyses are summarised in **Table 10**.

All analyses were repeated with TEI factor scores to allow for a detailed analysis of the role of TEI's constituent factors (e.g., Matthews et al., 2015; see **Appendix A**). None of the four subscales significantly predicted either NA or PA change. However, the sociability and self-control subscales predicted HR reactivity under stress (**Table 11**). The inclusion of the subscales at step 4 (ΔR^2 = .07, F(4, 37) = 9.28, p = .018, adjusted R^2 = .72), and conditional effects at step 5 (ΔR^2 = .07, F(4, 33) = 10.63, p = .010, adjusted R^2 = .79)

Table 10

Summary Statistics for Regressions of Stress Reactivity onto Pretask State, Condition, Personality, Cognitive Ability, Mental Health, and Global TEI Predictors

	Step 1: Pretask state		Step 2: Condition			Step 3: FFM, cognitive ability, mental health			Step 4: TEI			Step 5: TEI x condition interaction			Significant EI and covariate predictors (at Step 5)
Criterion	R^2	$F(1,56)$	R^2	ΔR^2	$\Delta F(1,55)$	R^2	ΔR^2	$\Delta F(9,46)$	R^2	ΔR^2	$\Delta F(1,45)$	R^2	ΔR^2	$\Delta F(1,44)$	
NA	.33	**28.09*** **	.72	.38	**73.38*** **	.78	.06	1.43	.78	.00	.74	.78	.00	.02	None
HR	.40	**35.08*** **	.56	.16	**19.20*** **	**.75**	**.19**	**2.88** **	.77	.02	2.37	.80	.03	**7.40***	TEI (β = -.94**)
															TEI x Condition (β = .69*)
															Sex (β = .37***)
															Gc (β = 1.46***)
															Gc x Condition (β = -.1.27***)
															O (β = -.1.09***)
															O x Condition (β = .67**)
															A (β = -.2.28*)

Notes. NA = negative affect; HR = heart rate; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; Gc = cognitive ability; O = openness; A = agreeableness. * = *p* < .05, ** = *p* < .01, *** = *p* < .001.

Table 11

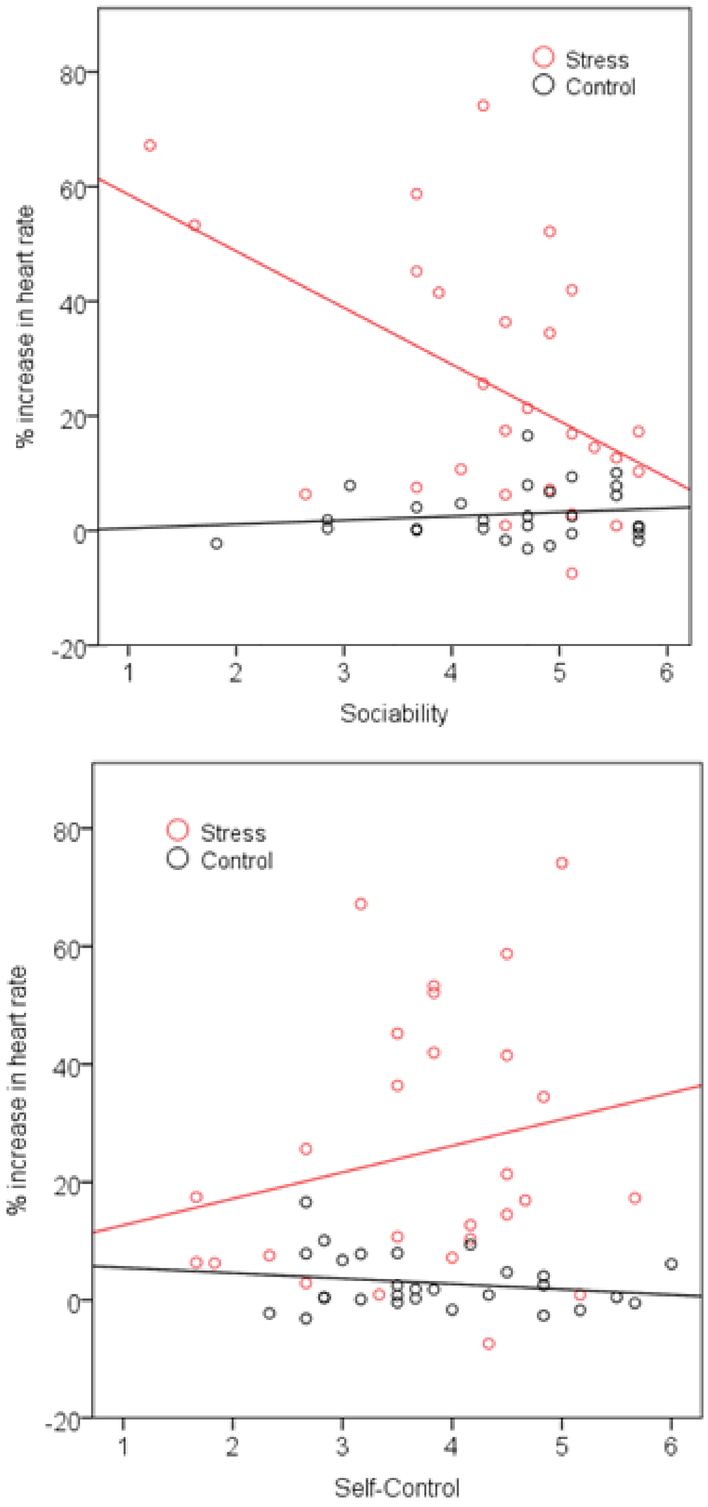
Summary Statistics for Regressions of Stress Reactivity onto Pretask State, Condition, Personality, Cognitive Ability, Mental Health, and Global TEI Subfactor Predictors

	Step 1: Pretask state		Step 2: Condition			Step 3: FFM, cognitive ability, mental health			Step 4: Emotionality, Self-Control, Sociability, Well-being			Step 5: TEI x condition interaction			Significant EI and covariate predictors (at Step 5)
Criterion	R^2	$F(1,56)$	R^2	ΔR^2	$\Delta F(1,55)$	R^2	ΔR^2	$\Delta F(9,46)$	R^2	ΔR^2	$\Delta F(1,45)$	R^2	ΔR^2	$\Delta F(1,44)$	
NA	.33	**28.09*** **	.72	.38	**73.38*** **	.78	.06	1.43	.78	.00	.16	.80	.02	1.00	None
HR	.40	**35.08*** **	.56	.16	**19.20*** **	.75	.19	**2.88** **	.83	.08	4.46	.91	.08	**7.53*** **	SEL (β = .78**) SEL x Condition (β = -.54*) SOC (β = -1.27***) SOC x Condition (β = 1.05***) Sex (β = .37***) Gc (β = 1.46***) Gc x Condition (β = -.1.27***) O (β = -.1.09***) O x Condition (β = .67**) A (β = -.2.28*)

Note. NA = negative affect; HR = heart rate; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; SEL = TEI (self- control factor); SOC = TEI (sociability factor); Gc = cognitive ability; O = openness; A = agreeableness). * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Figure 9

Self-Control and Sociability as Predictors of Physiological Reactivity, as a Function of Experimental Group



significantly improved the model. However, sociability and self-control exerted opposite effects. While the significant effects of both factors were restricted to the stress group, sociability predicted *smaller* HR responses in the stress group, whereas self-control predicted *larger* HR increases (**Figure 9**).

In sum, TEI did not predict mood reactivity in response to stress. However, global TEI (and the sociability subscale) predicted smaller HR responses in the stressful task, indicating a buffering effect. In contrast, the TEI self-control subscale predicted a larger change in HR in the stressful condition.

4.4.6.2 AEI and stress reactivity

Akin to the TEI analyses, separate hierarchical regressions were conducted to determine whether AEI predicted NA, PA, or HR change, after controlling for confounding variables. Findings regarding covariates are identical to those reported for the TEI analyses above, and are thus not repeated here. For **NA**, the insertion of AEI into the model (ΔR^2= .079, p = .651) and subsequent conditional effects (ΔR^2= .001, p = .738) did not result in a significant R^2 increase. Results were the same for **PA** (AEI: ΔR^2 = .04, p = .124; conditional effects ΔR^2 = .00, p = .995), and **HR** (AEI: ΔR^2 = .01, p = .183; conditional effects ΔR^2 = .001, p = .652). Thus, AEI did not predict any aspect of the acute stress response.

H2: TEI will predict faster psychological and physiological recovery from a stressful task

4.4.7 Effects of EI on stress recovery

Hierarchical regression analyses were also conducted to assess whether EI influenced stress responding once the stressor had ceased, after controlling for confounding influences. Stress recovery variables (see **Table 6**) were criterion. The first (baseline level of NA/PA/HR), second (condition), third (covariates), fourth (EI), and fifth steps (EI x condition interaction) of the regressions were the same.

4.4.7.1 TEI and stress recovery

For the prediction of **NA** recovery, the addition of the covariates significantly improved the model (ΔR^2 = .21, $F(9, 45) = 8.02$, p = .004, adjusted R^2 = .60), but the subsequent incorporation of TEI (ΔR^2 = .001, p = .68), and the TEI x condition variable (ΔR^2 = .009, p = .27), had no significant effect. At the final stage of the model, the only significant predictor of NA recovery was agreeableness (β = -1.22, p < .001), and its interaction term (β = .83, p = .012), indicating that individuals scoring higher in agreeableness showed enhanced recovery from stress (i.e., a bigger decrease in NA between T2 and T3). With respect to **PA** recovery, the entering of covariates (ΔR^2 = .06, p = .57), TEI (ΔR^2 = .02, p = .16), and the TEI x interaction term (ΔR^2 = .003, p = .57) all failed to significantly improve the model. Trait anxiety (β = -.36, p = .046) was the only significant predictor of PA recovery at the final step. The same was identified for **HR** recovery, whereby covariates (ΔR^2 = .06, p = .57), TEI (ΔR^2 = .06, p = .57), and TEI x condition (ΔR^2 = .06, p = .57) were not significant predictors. Analyses were repeated with TEI factor scores, and findings were no different from global TEI scores. Overall, TEI did not enhance mood or physiological recovery from stress.

4.4.7.2 AEI and stress recovery

The addition of AEI (R^2 change = .009, p = .269) or the AEI x condition interaction term (ΔR^2 = .001, p = .076) did not improve the model for predicting **NA** recovery. Similarly, AEI also did not significantly increase R^2 for the **PA** recovery model (AEI: ΔR^2 = .00, p = .937; AEI x condition: ΔR^2 = .017, p = .144), or the **HR** recovery model (AEI: ΔR^2 = .00, p = .770; AEI x condition: ΔR^2 = .005, p = .261). AEI was therefore not significantly related to stress recovery.

H3: TEI and AEI will predict greater use of adaptive coping strategies

4.4.8 Effects of EI on coping

The CITS-S coping measure assessed the use of three families of coping strategies throughout the task: task-focussed (e.g., “I did my best to follow instructions for the task”), maladaptive emotion-focussed (e.g., “I worried about what I would do next”), and avoidant coping (e.g., “I stayed detached or distanced from the situation”). To explore relationships between EI and coping, the analytic approach mirrored the ones taken for the reactivity and recovery analyses. Separate hierarchical regressions were conducted to determine if EI (or EI x condition effects) improved the prediction of how much participants used a particular family of coping strategies (i.e., task-focussed, emotion-focussed, avoidant), after controlling for confounding variables.

4.4.8.1 TEI and coping

For all models, experimental condition (step 1) predicted all outcomes, as described above. For the case of **task-focussed** coping, entering the covariates for step 2 significantly improved the model (ΔR^2 = .28, F(8, 48) = 4.99, p = .005, adjusted R^2 = .39), whereas the inclusion of TEI (ΔR^2 = .012, p = .290) and its interaction terms (ΔR^2 = .003, p = .616) at steps 3 and 4 did not. At the final step, only trait anxiety significantly predicted less task-focussed coping, regardless of condition (β = -.46, p = .028). Similarly, TEI (ΔR^2 = .004; p = .56) and the TEI x condition vector (ΔR^2 = .035, p = .10) also failed to predictive **emotion-focussed** coping. While entering the covariates at step 2 induced a significant R^2 change (ΔR^2 = .33, F(9, 47) = 3.06, p = .010, adjusted R^2 = .27), none remained significant at the final step. Similarly, neither the covariates (ΔR^2 = .16, p = .41), TEI (ΔR^2 = .008, p = .499), or TEI x condition (ΔR^2 = .008, p = .502) predicted the use of **avoidant** coping strategies. The non-significant findings regarding task-focussed and avoidant coping also applied to all four TEI subscales.

4.4.8.2 AEI and coping

Once confounding variables were controlled, the addition of AEI improved the predictive model for **task-focussed** coping (ΔR^2 = .07, $F(1, 45)$ = 5.12, p = .010, adjusted R^2 = .45), where higher AEI scores predicted *less* task-focussed coping (β = -.32, p = .010). This was not dependent on experimental condition (ΔR^2 = .00, p = .912). However, the R^2 change produced through the addition of AEI was not significant for the **emotion-focussed** coping model (ΔR^2 = .033, p = .012), akin to the addition of the AEI x condition predictor (ΔR^2 = .00, p = .99). Furthermore, AEI (ΔR^2 = .014, p = .378) nor its interaction term (ΔR^2 = .008, p = .491) predicted **avoidant** coping. In sum, AEI was only predictive of task-focussed coping.

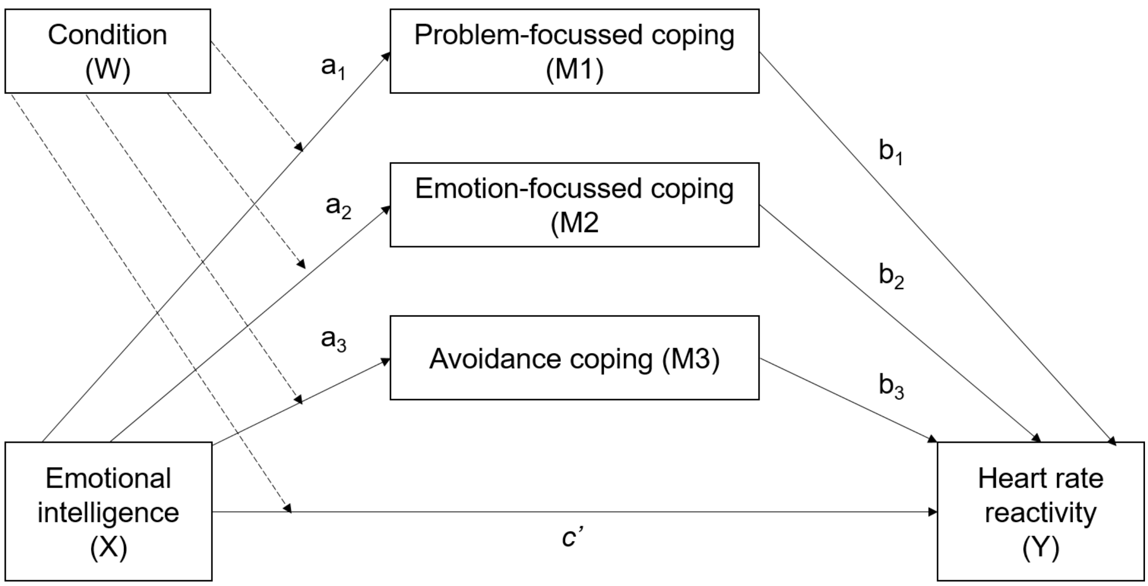
H4: The relationship between EI and stress reactivity will be mediated by adaptive emotion-focussed coping strategies

4.4.8.3 Coping as a mediator between EI and reactivity

Although the above section tested whether EI related to the usage of different coping strategies, further analyses are necessary to establish whether EI acted on stress responses through coping (Hayes, 2018). Specifically, moderated mediation was necessary to test whether the indirect effect of EI on stress responding through coping was moderated by experiment condition (Hayes, 2018), using the PROCESS macro for SPSS (Model 8; Hayes, 2018). This approach mirrors that of similar studies (e.g., Matthews et al., 2006). While contemporary guidance suggests that a significant direct relationship between X and Y is not necessary to run a mediation (Hayes, 2018), the study aimed to test coping as a mechanism to explain how EI might influence stress reactivity. Thus, based on the reactivity findings from the present study, and the small sample size of the study, mediation models were only tested for the cases where EI significantly predicted a stress outcome. In the models, EI was entered as the predictor (X), stress reactivity was entered as the outcome (Y), the three coping strategies were entered as mediators: task-focussed coping (M1), emotion-focussed coping (M2), and avoidance coping (M3). Condition was entered as the moderator (W), and, as before, personality traits, cognitive ability, and mental health were included as covariates. The model assessed the effect of the condition on the ‘a’ paths (i.e., relationship between EI and coping), rather than the ‘b’ paths (i.e., the relationship between coping and stress reactivity), since the analyses aimed to test for stress-dependent patterns of coping selection, facilitated by EI. **Figure 10** shows a conceptual diagram of the moderated mediation model being tested. The significance of indirect paths was assessed using 95%

Figure 10

A Conceptual Diagram of the Moderated Mediation Model with Coping Strategies as the Mediators and Condition as the Moderator



percentile bootstrap confidence intervals (CIs) with 10 000 bootstrap samples (Hayes, 2018), in line with recommendations for mediation analyses with small sample sizes (Creedon & Hayes, 2015).

Regression analyses indicated that the *a* path (regressing sociability onto coping strategies) was significant for avoidant coping (a_3: b = -6.44, SE = 2.74, p = .024), but not task-focussed or emotion-focussed coping (a_1 and a_2: ps > .05). None of the three strategies were significantly predictive of HR ($b_{1\text{-}3}$: ps > .05). The direct effect of sociability on HR reactivity was significant (c': b = -20.55, SE = 6.05, p = .0016), and moderated by condition (b = 11.38, SE = 18.30, p = .0031), such that sociability only predicted HR reactivity under stress (stress: b = -.9.17, SE = 3.34, 95% CI [-15.92, -2.42]; control: b = 2.20, SE = 3.40, 95% CI [-4.68, 9.09]). However, there were no indirect effects. Sociability was not indirectly linked to HR reactivity through task-focussed, emotion-focussed, or avoidant coping (see **Appendix I** for full moderated mediation output). The moderated mediation model produced for the self-control factor resulted in a very similar output, and no indirect effects were identified. To avoid repetition, this information is included in **Appendix I** rather than the main text.

In sum, coping did not explain the relationship between sociability and reactivity, signalling the presence of other potential underlying mechanisms that were not explored in the present study.

4.5 Discussion of key findings

Findings did not support a clear-cut role for either TEI or AEI as a moderator of stress reactivity or recovery. In terms of specific hypotheses, **H1** (which predicted that TEI would predict less psychological and physiological reactivity), received mixed support. While neither TEI (nor any TEI subscales) nor AEI predicted psychological reactivity, TEI predicted smaller *HR* increases in the stress condition, compared to the control condition (supporting **H1**). This finding appeared to be solely attributable to the sociability subscale. However, the TEI self-control subscale predicted *larger* increases in HR in the stress condition, which did not support **H1. H2** – which predicted that TEI would promote recovery from stress – was not supported. AEI was also unrelated to recovery. With respect to coping, AEI (EM) predicted less (adaptive) task-focussed coping across both conditions (not supporting **H3**). **H4**, which proposed coping would mediate the relationship between EI and stress reactivity – was also not supported.

4.5.1 EI and reactivity to acute psychosocial stress

When under stress, individuals with higher global TEI scores showed a smaller increase in HR. However, while few studies perform TEI analyses at the subscale level, doing so can yield more meaningful interpretations than working exclusively with composite TEI scores (Downey et al., 2010; Zeidner et al., 2012a). This is crucial, given that TEI's nomological network includes many adaptive personal characteristics (**Figure 5**); exploratory analyses of EI subscales permits a nuanced insight into which aspects of EI may be useful in which contexts (Matthews et al., 2015). The exploratory analyses in the present study revealed a specific role for trait sociability with regards to stress reactivity. Individuals with high scores on the sociability subscale of the TEIQue-ASF (Petrides, 2009) showed a significantly smaller increase in HR in the stress condition. Put simply, in a socially stressful situation, individuals that perceived themselves as socially competent became less stressed, compared to individuals that did not perceive themselves as socially competent. While significant findings were not found for subjective stress reactivity (i.e., PANAS scores), this is not unexpected, since values for self-reported and physiological measures of stress only correspond approximately 25% of the time (Campbell & Ehlert, 2012). Thus, findings suggest a potentially protective role of TEI (specifically, the sociability subscale).

The findings of the present study echo those by Mikolajczak and colleagues, one of the only EI researchers to perform facet-level analyses in relation to stress reactivity. Across several studies, their research indicates that higher global TEI scores are associated with significantly lower reactivity to stress at both psychological (i.e., mood deterioration) and biological (i.e., salivary cortisol) levels (Mikolajczak et al., 2007; 2009). Furthermore, trait sociability had the strongest effect out of all four subscales (emotionality, sociability, well-being, self-control) in all cases. Akin to the present study, the stress induction paradigm in those studies was psychosocial in nature (i.e., Trier Social Stress Test; Kirschbaum et al., 1993). Both paradigms have a strong social evaluation component, whereby participants are exposed to a potentially negative judgment by others (Campbell & Ehlert, 2012). In the present study, this was achieved by having the participant sing in front of an experimenter, further enhanced by the belief that the performance was being video-recorded (purportedly for the purposes of further analysis). Trait sociability appears helpful in that respect. According to the TEIQue sampling domain (Petrides, 2009; **Table 1**), individuals with high scores on the sociability factor perceive themselves to be capable of influencing other people's feelings, forthright, frank, and willing to stand up for their rights, and as accomplished networkers with excellent social skills (Petrides, 2009). At face value, it therefore seems unsurprising that individuals who think of themselves as more assertive, and confident in their abilities to influence others' emotions (i.e., trait sociability), become less stressed in situations where there is a potential for negative judgement from others. To decipher what *precisely* might make sociability useful in helping to modulate the stress response, it is necessary to examine the specific items in the TEIQue-ASF that make up the sociability subscale. For each item, the participant rates the extent to which that statement applies to them:

- I'm good at getting along with my classmates (Item 6)
- I find it hard to stand up for my rights (Item 10, reverse-scored)
- I can make other people feel better when I want to (Item 11)
- I would describe myself as a good negotiator (Item 21)
- I tend to "back down" even if I know I'm right (Item 25, reverse-scored)
- I'm unable to change the way other people feel (Item 26, reverse-scored)

The factorial structure of the TEIQue proposes that the above sociability items tap three TEI facets: social competence (Items 6, 21), emotion management (others) (Items 11, 26), and assertiveness (Items 10, 25) (Petrides & Furnham, 2003). Several of these items overlap conceptually with the agreeableness items of the mini-IPIP, for which high scores represent a general pro-social orientation towards others (i.e., being agreeable) (Donnellan et al., 2006; **Appendix C**). In addition, *agreeableness* was the only personality trait that significantly predicted stress reactivity. In the stress condition only, adolescents scoring more highly on agreeableness showed a smaller increase in HR to sociability (**Tables 10** and **11**). Plausibly, there could be a common aspect of trait sociability and agreeableness that helps facilitate stress response modulation. The personality literature describes agreeableness as a willingness to be helpful and trusting, and to possess a pro-social orientation towards others (Tobin & Gadke, 2015). Higher levels do tend to predict positive life outcomes for adolescents in a general sense, for example through predicting life satisfaction (e.g., Jovanović, 2019), and acting as a marker for pro-social behaviours (Jenson-Campbell & Granziano, 2001; Gleason, Jenson-Campbell, & Richardson, 2004).

The general picture for associations between agreeableness and stress reactivity is one of inconsistency, where null findings are often reported (e.g., Oswald, Zandi, Nestadt, Potash, Kalaydjian, & Wand, 2006, Williams, Rau, Cribbet, & Gunn, 2009). However, some evidence suggests that agreeableness predicts adaptive ER in contexts in which there are strong social consequences. In particular, individuals who score higher on the trait show greater efforts to regulate stress (e.g., when presented with distressing vignettes, or viewing distressing emotional stimuli), especially in the presence of another person (Studies 1 and 2; Tobin, Graziano, Vanman, & Tassinary, 2000). Those findings are corroborated with psychophysiological evidence (electromyography of the cheeks and brows; Study 3; Tobin et al., 2000). The need to please others has been suggested as on way that agreeableness could aid psychosocial stress regulation (Dunkley, Blankstein, Zuroff, & Hui, 2006). Experimental evidence suggests that compared to disagreeable individuals, agreeable individuals might possess an ability to diffuse negative social cues in social environment, by "turning the other cheek" and focussing on prosocial thoughts (Meier, Robinson, & Wilkowski, 2006). Perhaps in times of psychosocial stress (i.e., situations with a strong element of social evaluation), individuals with higher levels of the agreeableness trait are able to 'activate' prosocial thoughts, and thus moderate stressful sensations and feelings. In the case of the present study, perhaps agreeable participants (either consciously or unconsciously) modified their stress response due to the presence of the experimenter. That notion is supported by evidence demonstrates that agreeable individuals tend to have more prosocial goals of ER (i.e., to maintain or promote positive social interactions and strengthen relationships), as opposed to pro-hedonic or performance goals) (Eldesouky &

English, 2018; Roberts & Robins, 2000). While the above points discuss how *agreeableness* may have contributed to adaptive stress reactivity, the same principles may apply to sociability, since the two traits correlated, and each predicted the same outcome. Despite their similarities, however, they are not identical constructs. In addition, crucially, Big Five personality traits (including agreeableness) were controlled for in all hierarchical regressions of the present study, and yet, sociability still demonstrated incremental validity in predicting physiological responses to acute stress, suggesting it contributes something unique to stress regulation.

Upon comparing the items between the mini-IPIP (Donnellan et al., 2006; **Appendix C**) and the TEIQue-ASF (Petrides, 2009), *assertiveness* appears to be the key distinguishing difference between agreeableness and sociability. Perhaps adolescents that score highly on trait sociability handle psychosocial stressors better due to their assertiveness and confidence in social contexts. Assertive individuals are self-efficacious, and confident in their abilities, traits thought to promote resilience in adolescence (Murphey, Barry, & Vaughn, 2013). While general self-efficacy - an individual's perception of their ability to successfully execute a specific task, in order to achieve a desired result (Bandura, 1997) - was not measured directly in the present study, TEI is typically conceptualised as "emotional self-efficacy" (Petrides, 2009), with sociability specifically relating to emotional self-efficacy in situations involving other people. The stress paradigm in the present study required that participants simultaneously completed a task (i.e., chose and sang a song), regulated their emotional response, whilst dealing with social evaluation pressure. Historically, self-efficacy has been viewed as critical in ER, especially in adverse circumstances (Saarni, 1999), enabling individuals to face stressful demands with confidence, and as a result, flourish in times of acute stress (Jerusalem & Mittag, 1995; Ozer & Bandura, 1990). Indeed, research has shown that higher levels of self-efficacy can show beneficial effects for stress reactivity (e.g., Mikolajczak et al., 2008; Wiedenfield, O'Leary, Bandura, Brown, Levine, & Raska, 1990). Thus, it follows that individuals with high self-efficacy would inherently find the task less stressful.

Placing the findings of the present study in context suggests that within TEI's nomological network, agreeableness, assertiveness, and self-efficacy, are the key factors involved in facilitating ER in psychosocially stressful situations. The precise mechanism of action that connects those constructs to dampened stress reactivity is not clear, but there a likely a number of interconnecting processes involved (e.g., cognitive appraisal; locus of control). Across multiple studies, evidence suggests that individuals with high TEI scores appraise a stressful tasks as less threatening (Mikolajczak et al., 2006; Mikolajczak & Luminet, 2008; Salovey et al., 2002). Since cognitive appraisal is a common means of modifying one's appraisal of a situation to regulate its emotional impact (Gross, 2015), perhaps high sociability individuals perceive socially charged acute stressors as less threatening, and their prosocial nature and self-efficacy enables them to instead focus on managing their emotional response (Meier et al., 2006; Mikolajczak et al., 2008). Alternatively, perhaps they felt more in control of the situation (locus of control - an individual's sense of control over events - is a known protective factor in stressful situations) (Jerusalem & Schwarzer, 1992; Roddenberry & Renk, 2010). Testing the involvement of those potential processes could form the basis of future TEI investigations.

Although not entirely unexpected, AEI did not predict any aspect of the stress response process. As signalled in the introduction, there is generally a dearth of research that has examined AEI and acute stress reactivity. However, the limited evidence available paints an unclear picture. While AEI buffered subjective stress in one study (Ruiz-Aranda et al., 2011), it had no significant effect in two others (Limonero et al., 2015; Matthews et al., 2006), yet intensified physiological stress in another case (Bechtoldt & Schneider, 2016; Rash & Prkachin, 2013). The findings of the present study suggest that, for adolescents at least, *perceived* emotional skills (i.e., TEI) appear more useful in psychosocially stressful contexts. As TEI was predictive of objective, physiological reactivity (HR), and not self-report, there was little risk that findings arose from "contamination", where findings can arise from shared measurement error (i.e., positive self-evaluations) (Keefer et al., 2018). Put simply, it may be that how confident adolescents feel about their emotional abilities matters more for stress regulation than their actual emotion-cognitive skill. While the role of TEI (and the sociability subscale) in the stress response appears to make theoretical sense, there were other findings that did not fit expectations.

4.5.2 EI and reactivity to acute psychosocial stress: Unexpected findings

The first puzzling finding is that the TEI self-control subscale also incrementally predicted physiological reactivity. However, effects were in the opposite (maladaptive) direction to sociability; in the stress condition, individuals with higher scores on the self-control subscale showed *larger* increases in HR. As the TEIQue self-control scale taps into the TEI facets of emotion regulation, impulsiveness (low), and stress management (Petrides, 2009), it is not entirely clear why this trait would be unhelpful when regulating one's response to an acutely stressful situation. However, for perspective, the standardised coefficient for the sociability scale x condition interaction coefficient was larger ($\beta = 1.27$, $p < .001$) than the self-control x condition interaction coefficient ($\beta = -.54$, $p < .05$). There is a possibility that the self-control finding could possibly be spurious. Before attempting to determine the significance of the self-control finding, the study needs to be replicated. The study described in Chapter 5 involves a direct replication of the current study with a naïve sample. Furthermore, a pooled sample analysis of the two studies should shed more light on whether the finding prevails in a larger sample, where the analyses will hold more statistical power.

Secondly, in contrast to predictions (**H2**), TEI nor AEI predicted recovery from stress. Considering that EI should represent more efficient (e.g., faster) emotion information processing (EIP) in stressful contexts, speeding up recovery (Fernández-Berrocal & Extremera, 2006; Matthews et al., 2002), this finding is surprising. While the experimental literature suggests that EI appears useful for stress recovery, in both the short and long term, it is important to note that issues regarding methodology may have inflated the findings of other studies (Lea et al., 2019). Perhaps when EI is *rigorously* tested as a moderator of stress recovery (i.e., by using a control group, and accounting for confounding variables), EI no longer explains unique variance in stress recovery. It may instead be that EI relates to cognitive aspects of the recovery process (e.g., post-event rumination), as assessed in Study 2 (Chapter 5).

The third unexpected finding relates to effortful, explicit coping processes. The present study assessed task-focussed, emotion-focussed coping, and avoidance coping (Endler & Parker, 1999; **Table 7**), using the Coping Inventory for Task Stressors (CITS; Matthews & Campbell, 1998). Generally, evidence to date suggests that EI promotes more adaptive coping in adults (Matthews et al, 2002; 2006; O'Connor et al., 2017), though none examined state-based coping in adolescents. In the present study, whilst neither TEI nor AEI related to context-dependent use of any particular coping strategy, AEI predicted less task-based coping across both stressful *and* non-stressful conditions (though the effect was stronger in the former). Because task-focussed coping is often highlighted as an adaptive means of coping with stressful situations (e.g., Davey, 1993), it might not seem clear why an ability to manage emotions (i.e., AEI) would relate to less task-focussed coping. However, a closer inspection of the scale and the stressor itself suggests a potential explanation. Task-focussed coping strategies focus on tackling the source of stress directly, with items including; “I was careful to avoid mistakes”, and “I did my best to follow instructions for the task”. Although identifying universal ‘adaptive’ strategies is not feasible, since the efficacy of any one strategy is context-dependent (Baker & Berenbaum, 2007; Carver & Connor-Smith, 2010), Folkman & Moskowitz, 2004), active coping (i.e., task-focussed) is more effective in *controllable* situations (e.g., Bowman & Stern, 1995). However, in the SSST paradigm, the stress is instead largely *uncontrollable* (e.g., participants had a fixed amount of time to prepare and sing the song, reinforced with visible countdowns), and the emphasis was on social evaluation, rather than evaluation of performance *per se* (i.e., the quality of the singing was not assessed). Thus, in such situations is probably more advantageous to keep calm (e.g., by engaging with emotion-focussed coping strategies), than to strive for performance-based outcomes (Folkman & Moskowitz, 2004). Findings could suggest that adolescents with high emotion management abilities reduce the likelihood of using unhelpful strategies under psychosocial stress. However, since AEI did not predict stress reactivity or recovery, we cannot be certain about the adaptive value that phenomenon holds.

4.5.3 Implications for EI as a protective marker in adolescence

As discussed in Chapters 1-3, one school of thought proposes that EI may buffer the effects of adversity (acute stress) on life outcomes in adolescents by exerting effects on ER processes. The present study examined how EI relates to certain ER processes relating to the families of emotion response modulation (where the individual directly modulates the stress response once an emotion has been elicited: i.e., stress reactivity and recovery), and cognitive change (modifying one's appraisal of a situation to regulate its emotional impact, using explicit coping strategies; Gross, 1998a). The key finding was that, when measured as a trait (a constellation of emotional self-perceptions; Petrides et al., 2007), EI predicted more favourable stress response modulation under psychosocial stress. Sociability appeared to be the key element of TEI responsible for that phenomenon, where higher levels were associated with lower HR reactivity in the stress condition. The present study's findings have potential implications for EI as part of a resilience framework.

Whilst causation cannot be inferred from the current set of findings, there are some tentative suggestions that can be made with respect to resilience. In particular, how confident adolescents feel about their emotional competence seems to be an important protective factor for adolescents facing stressful situations. When confronted with a stressor, individuals need to avoid hyperreactivity (i.e., a heightened response) to prevent placing an unnecessary burden ('allostatic overload') on stress response systems of the body (e.g., Arora et al., 2010; Rano et al., 2018). Since TEI predicted a more adaptive stress response, this could help explain why TEI is often associated with more positive stress-related outcomes in young people, such as good mental health (e.g., Fernandez-Berrocal et al., 2006; Schutte et al., 2007), improved well-being (e.g., Austin et al., 2005; Chamorro-

Premuzic et al., 2007), and educational attainment (MacCann et al., 2020). In addition, AEI was associated with a reduced likelihood of using unhelpful strategies under psychosocial stress (i.e., less task-focussed coping). However, it is not clear to what extent this tendency is protective, since it was not restricted to the stress condition, and AEI nor task-focussed coping predicted stress reactivity or recovery.

Specifically, findings suggest that TEI may be especially useful in *interpersonal* contexts. Psychosocial stress is particularly potent in adolescent daily life, since adolescents are particularly sensitive to the effects of social evaluation (Gunnar, Talge, & Herrera, 2009; Somerville, 2013). The psychosocial task selected for the present study aimed to somewhat mimic everyday sources of social stress for young people (e.g., presentations; peer pressure; uncomfortable interactions with others; e.g., Rüppel, Sebastian, & Walter, 2015; Zeidner & Matthews, 2005), through fear of failure, social evaluative threat, and a lack of control (Buck, 2016). However, while the study has yielded a potentially protective role for EI in social settings, it is important to note that the current finding may not extend to other types of stressor. The specific emotions and physiological outcomes that emerge in a challenging situation are highly idiosyncratic, and depend on many stressor characteristics (i.e., levels of social evaluative threat, cognitive effort required; Denson, Spanovic, & Miller, 2009). It seems unlikely that sociability would be as useful in non-social contexts (e.g., cognitive stressors).

4.5.4 Limitations

The present study had several limitations that warrant consideration. The first issue relates to its sample size (final n = 58). While recruiting participants within a narrow age band (i.e., between the ages of 16 and 18 years) allowed the exploration of EI processes within an empirically ‘forgotten’ group (Kennedy, 2010), this presented a challenge in terms of participant recruitment. Though not dissimilar to the sample size achieved in many similar EI experimental studies (e.g., n = 30; Laborde et al., 2011; n = 30 ; Petrides & Furnham, 2003; n = 48; Salovey et al., 2002; n = 60; Sevdalis et al., 2007), the sample size of 58 is still relatively small. Consequently, effect sizes were small; the largest achieved in the study was = .08 (change in R^2 achieved by adding TEI subscales to the HR reactivity predictor model). Furthermore, a post-hoc power analysis using G*Power (Erdfelder et al., 1996) indicated that the study was underpowered (.349), suggesting that a larger sample size is needed to rule findings out as false positives. Thus, to test that, data from Study 1 will be pooled from the reactivity data from Study 2 (Chapter 5), which uses the same stress induction procedure (i.e., SSST), and methods of stress measurement (i.e., HR; PANAS). Since the pooled analysis will have a larger participant sample, statistical power should be higher, and reduce the margin of error, meaning conclusions regarding the role of EI will be more justified (Kühberger, Fritz, & Scherndl, 2014).

The very low internal reliability of the STEU-B (.38) was also a concern. Whilst as a precaution, STEU scores were not interpreted or included in analyses, it is important to note that the STEU-B may not be appropriate for older adolescents. Though others have also identified issues with STEU reliability (e.g., Austin, 2010), it is not clear why the measure was so unreliable in this case, since the unreliability could not be attributed to any particular item(s). Perhaps, the vignettes were not age-appropriate (e.g., those relating to the workplace), which, due to the unfamiliarity of the situation (i.e., some adolescents may not have yet been in employment), could have hindered the adolescents’ ability to understand the contextual nature of the emotions being felt. As alluded to in Chapter 2, there is a risk that older adolescents can disengage with materials when the language, examples, and values used, are perceived as irrelevant (Yeager et al., 2017). In contrast, whilst still less than desirable, the reliability of the STEM-B (.67) was better, and more comparable with other studies (e.g., .73; Austin, 2010; .84; Allen et al. 2015; .63: de Motta, Carvalho, Castilho, & Pato, 2018). Furthermore, the present study only examined the role of TEI and the 'strategic' branch of the AEI, which represents higher-level cognitive processes (Mayer et al., 2002). However, understanding the role of the 'experiential' branch, namely emotion perception, is also important to consider when attempting to untangle the precise mechanisms through which EI could buffer the effects of acute stress. In theory, being able to recognise how one is feeling (i.e., higher emotion perception scores) could help implement appropriate ER strategies in acutely stressful situations. Study 2 (Chapter 5) considers this perspective by investigating TEI and AEI (emotion perception and emotion management) with respect to attentional processing under stress.

A further limitation is that the present study only included a single marker of physiological stress reactivity (HR). However, using a *combination* of physiological parameters (alongside a subjective measure) is considered the most valid way of measuring stress reactivity (Campbell & Ehlert, 2012), and allows for a more fine-grained analysis of stress response patterns that could be facilitated by EI. Empirical evidence suggests that electrodermal activity (EDA), as measured via skin conductance, is a valid and reliable marker of acute stress, that provides different information about sympathetic activity that is not captured by cardiac autonomic indices alone (e.g., Fernandes, Helawar, Lokesh, Tari, Shahapurkar, 2014; Mestanik, Visnovcova, & Tonhajzerova, 2014). To address the limitation of a single physiological stress marker, the study described in Chapter 5 uses both HR and EDA to capture the stress response.

In conclusion, findings regarding EI and stress reactivity and recovery were mixed. While TEI (particularly the sociability domain) appeared to have a physiologically protective function for adolescents in socially threatening situations, the self-control factor seemed to exacerbate the physiological response. In contrast, AEI did not significantly influence any of the study variables, suggesting that perceived emotional skills may be more pertinent than actual emotional skills. Comparing the present findings alongside those concerning EI and attentional processing under stress (Study 2), and EI and ER on social media (Study 3) will help identify any emerging themes, and better understand the role of context. For example, whether sociability plays an important role in multiple aspects of ER, or just response modulation (i.e., the present study). To explore additional mechanisms through which EI might influence stress responding, Study 2 will test whether EI moderates early attentional processing under stress in adolescents. In addition, reactivity data from the present study will be pooled with reactivity data from Study 2, to re-assess relationships between EI and reactivity in a larger sample. Study 2 will also investigate the role of another aspect of AEI: emotion perception ability, and whether EI is linked to rumination after stressful experience.

CHAPTER FIVE

EMOTIONAL INTELLIGENCE AND ATTENTIONAL PROCESSING OF EMOTION UNDER STRESS

5.1 Chapter overview

This chapter presents the findings of Study 2, an experimental study that aimed to investigate how EI influences early attentional selection under acute psychosocial stress, and post-event rumination. Theoretically, if adaptive, EI should embody avoidance of threat (i.e., attentional bias *away* from threat) in non-stressful conditions, but hypervigilance for threat (i.e., attentional bias *towards* threat) in acutely stressful conditions (Yiend, 2009), and less post-stressor rumination (LeMoult, et al., 2013). While that has been tested in adults (Davis, 2018b), no research has explored EI and attentional processing with adolescents. Using a dot-probe task, participants' bias for different emotions (happy, sad, angry) was ascertained in either stressful or control conditions. Findings indicated that while ability EI (AEI) did not moderate any aspect of stress regulation, the trait EI (TEI) self-control subscale corresponded with avoidance of sad emotion, and less post-task rumination. However, because those effects were not contingent on experimental condition (i.e., stressful, control), it is not clear whether self-control underscores *adaptive* processing. Study 2 also served as a replication for Study 1. Pooled data from both studies indicated that TEI sociability subscale buffered both psychological and physiological reactivity, suggesting an important role for perceived social competence in the context of acute social evaluative stress. However, the questionable ecological validity of the above findings calls for an exploration into EI and stress regulation processes in a more applied setting.

5.2 Introduction

The programme of research began by exploring whether EI directly moderated stress reactivity and recovery (Chapter 4). An experimental approach was used, whereby analyses tested whether different conceptualisations of trait EI (TEI) and ability EI (AEI; emotion understanding; emotion management) predicted psychological (self-reported change in mood) and physiological (HR) outcomes, in both stressful and control conditions. The present study was designed to extend Study 1 in several ways, with amendments made to address limitations and broaden the scope of the research. First, Study 2 omits the use of the Situational Test of Emotion Understanding - Brief (STEU-B; Allen et al., 2014), since Study 1 highlighted the STEU-B as an unreliable measure of emotional understanding for the participant group (α = .38). However, in addition to assessing emotion management using the Situational Test of Emotion Management - Brief (STEM-B; Allen et al., 2015), Study 2 also captures the experiential branch of AEI through measurement of emotion perception, to maximise the explanatory power of the findings. Second, while Study 2 uses the same stress paradigm as Study 1 (the Sing-a-Song Stress Test; Brouwer & Högervorst, 2014), it also includes a second marker of autonomic nervous system (ANS) activity: electrodermal activity (EDA). Third, in addition to measuring how EI relates to the response modulation processes, Study 2 also investigates how EI might contribute to early orienting processes, and post-stressor rumination.

5.2.1 Extending the investigation of EI and physiological stress reactivity

To briefly recap the stress response: when an individual is exposed to an acute stressor, the 'fight or flight' response activates the sympathetic-adrenal-medullary (SAM) pathway of the ANS, and the hypothalamic-pituitary-adrenocortical (HPA) axis pathways (McEwen, 2006).

These pathways catalyse a cascade of emotional, physiological and behavioural changes that ultimately lead to the individual's preparedness and readiness to respond to the stressor. Many of those changes can be measured in the laboratory. Study 1 measured stress reactivity using HR an index for ANS reactivity, due to its capacity to represent general ANS reactivity to acute psychosocial stress (Cohen, et al., 1995), and its rapid response to stress in comparison to other indices (e.g., cortisol) (Tarullo & Gunnar, 2006). However, using a combination of physiological parameters (alongside a subjective measure) is recommended (Campbell & Ehlert, 2012). EDA is another biomarker commonly used to estimate stress reactivity, referring to electrical changes that arise as a result of changes in sweat gland permeability, measured at the surface of the skin (Critchley & Nagai, 2013). When an individual becomes stressed, one of the downstream effects of the sympathetic-adrenal-medullary (SAM) pathway is to enable increased sweating, by increasing the permeability of the apocrine and apoeccrine sweat glands (Dawson, Schell, & Filion, 2017). A common way to capture EDA in laboratory conditions is to measure electrical conductance across the skin, which can be achieved by passing a very small amount of current between two electrodes in contact with the skin, measured in microSiemens (μS). Empirical evidence suggests that EDA, as measured via skin conductance, is a valid and reliable marker of acute stress, that provides different information about sympathetic activity that is not captured by cardiac autonomic indices alone (e.g., Fernandes et al., 2014; Mestanik et al., 2014). The two indices typically show different temporal patterns in response to acute stress (where changes in EDA tend to occur slightly after changes in HR, e.g., Nikolic-Popovic, & Goubran, 2011). Measuring stress reactivity in the form of both HR and EDA should allow for a more fine-grained analysis of stress response patterns that could be facilitated by EI.

As described in the most empirically supported model of ER (Gross, 1998a), ER processes do not occur in isolation. In particular, both theory and evidence suggest that stress reactivity and attentional processes are intrinsically linked (e.g., Appelhans & Luecken, 2007; Jiang, Buchanan, Yao, Zhang, Wu, & Zhang, 2017). For example, when McHugh, Behar, Gutner, Geem, and Otto (2010) examined the impact of acute cortisol reactivity on attentional bias to threat-related words in a dot probe paradigm, *heightened* cortisol reactivity to a psychological stressor was associated with *decreased* attentional bias for verbal threatening stimuli (i.e., avoidance). Put simply, how an individual reacts to a stimulus may be influenced by how they have attended to it, and vice versa. Thus, in addition to re-examining the role of EI in stress response modulation, the present study also considered how EI might contribute to the ER process of automatic attentional deployment under stress.

5.2.2 EI and attention

Attentional deployment, the process of selectively concentrating on some stimulus in the internal or external environment, is an important ER process (Gross, 1998a). Affect-biased attention refers to selective attention processes by which an individual becomes 'tuned' to favour certain categories of affectively salient stimuli before they are encountered, an ER strategy that has the potential to buffer acute stress (Todd, Cunningham, Anderson, & Thompson, 2012). Attentional processes are critical for ER, since rapid and efficient selection of emotionally salient stimuli is critical for flexible and adaptive behaviour (Gross & Thompson, 2007; Yamaguchi & Onoda, 2012). Consciously (e.g., mindfulness; rumination) or automatically regulating attention (e.g., shifting gaze) could be an important pathway through which EI could buffer the effects of stress, and ultimately, promote well-being (e.g., Davis, 2018b).

To date, affect-biased attentional processing under stress has been primarily investigated in clinical and sub-clinical samples. In those populations, maladaptive attentional processing is common (for review, see Weierich et al., 2008). Empirical research consistently identifies that those with anxiety disorders (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Mobini & Grant, 2007), or high trait anxiety (Koster, Crombes, Verschuere, Damme, & Wiersema, 2006), show an attentional bias for threatening stimuli. This phenomena could contribute to a 'vicious cycle', where high anxiety propagates a bias for negative emotion, leading to heightened stress reactivity, which in turn then acts to further maintain high anxiety levels (Williams, Mathews, & MacLeod, 1996). Clearly, focussing on threatening stimuli is maladaptive when threat levels (derived from internal state, or external stimuli) are low. However, when threat levels are *high* (i.e., when the individual is experiencing acute stress), selectively focussing on threatening stimuli *is* adaptive, as it allows the individual to react and respond to the source of threat appropriately (Mogg & Bradley, 1998). Thus, the prevailing theoretical model proposes that whether an individual should allocate more attention to negative or positive emotional material is dependent on the level of threat present. 'Healthy' processing is flexible, and theoretically embodies avoidance of threat (i.e., attentional bias *away* from threat) in non-stressful conditions, but hypervigilance for threat (i.e., attentional bias *towards* threat) in acutely stressful conditions (Yiend, 2009). According to the notion of EI as a driver of efficient emotion processing, EI may moderate early attentional biases for emotional information (Fiori & Veseley-Maillefer, 2018; Veseley-Maillefer et al., 2018). If EI is truly adaptive in this sense, patterns of visual processing of high EI scorers should align more closely with the adaptive profile than low scorers, a hypothesis put forward by Davis (2018b).

Few experimental studies have examined automatic attentional processes with respect to EI (Gutiérrez-Cobo et al., 2016). Furthermore, studies have used varying attention paradigms and measures of attention, and findings are subsequently contradictory (Gutiérrez-Cobo et al., 2016). While high TEI predicted attentional bias towards emotional (vs. neutral words) in one study (Coffey et al., 2003), attention towards emotional vs. neutral words did not vary according to TEI in another study (Fisher, Sass, Heller, Silton, Edgar, Stewart, & Miller, 2010). In addition, some studies that have focussed on AEI have not suggested a clear role for AEI in attentional processes. For example, Fiori and Antonakis (2012) found that none of the AEI branches predicted performance on a selective attention task (where participants were required to ignore distracting emotional information). However, others have identified that AEI predicts faster discrimination of negative emotion (vs. neutral; Farrelly & Austin, 2007). While another study indicated that AEI predicted faster reaction times in the emotional Stroop task (Martin & Thomas, 2011), a composite score (from the Mayer-Salovey-Caruso Emotional Intelligence Test [MSCEIT]) was used as the predictor; an approach that does not provide insight into which EI components might be pertinent to attentional processing.

EI studies that have employed eye-tracking technology, a rigorous paradigm whereby attention can be directly and continuously measured (Waechter et al., 2014), are scarce. However, eye-tracking is necessary to capture the automatic processing of emotional information that occurs independently of acquired knowledge (Fiori & Veseley-Maillefer, 2018; Veseley-Maillefer et al., 2018). Using a preferential passive viewing task, TEI appears to direct visual attention towards positive stimuli (e.g., happy faces), and away from threatening stimuli (Lea et al., 2018). However, to truly test the hypothesis that EI facilitates healthy attentional processing to buffer the effects of acute stress, research needs to examine how EI relates to attentional processes 'in action' (i.e., when experiencing situational stress under controlled conditions).

Only three studies to date have explicitly examined the relationship between EI and affect-biased attention under stress (see Chapter 3, Section 3.3.1.2). While a visual search activity showed no association between TEI and performance on a visual search task (Matthews et al., 2015), the other two studies used a dot-probe task that measured attentional bias for emotional stimuli over neutral stimuli (MacLeod et al., 1986). To recap, a standard dot-probe paradigm involves the simultaneous presentation of two stimuli (cues) that differ in their emotional content (e.g., threatening vs. neutral), followed by the presentation of a probe (normally a triangle or other symbol). Participants then indicate the location of the probe as quickly and accurately as possible through key press; the response to the 'attended' location is usually faster. Using a dot-probe paradigm, Mikolajczak et al. (2009) found that high TEI (self-control) individuals showed a bias for emotional words under stressful conditions, and a bias for neutral words under neutral conditions, with the opposite found for low TEI individuals. That study was the first to indicate that EI may moderate the impact of stress by facilitating 'healthy' visual processing of stimuli. Davis (2018b) built on that study, using a more robust methodology. Biologically salient material (i.e., human faces) were used instead of words, and the study design distinguished between stimuli valence, by including negative, positive, and neutral faces (rather than using simple emotional vs. neutral distinctions made by previous studies). AEI (emotion understanding and management) was measured in addition to TEI. Finally, the study employed eye-tracking to capture first fixations to emotional stimuli, prior to behavioural response (i.e., keypress). Findings were less clear-cut than those found by Mikolajczak et al. (2009). While high AEI management and TEI well-being predicted bias *away* from negative emotion (angry and sad faces, respectively), TEI (sociability and emotionality subscales) predicted bias *towards* negative emotion (angry and sad faces, respectively). Furthermore, most effects operated across both stressful and control conditions. Ultimately, the findings led to a confusing picture that suggested that EI may not underlie adaptive attentional processing under stress (Davis, 2018b).

There is a pressing need to replicate the above preliminary work. Thus, the present study serves to replicate the attentional bias paradigm employed by Davis (2018b), to test whether the pattern of findings regarding EI and attentional bias under stress generalise to an adolescent sample. EI may moderate attentional processes differently in adolescence, a developmental stage that involves emotional development, yet also substantial emotion regulation (ER) challenges (Ahmed et al., 2015; Riediger & Klipker, 2014). The role of emotion perception ability in attentional processes also warrants consideration, yet is missing from previous work (e.g., Davis, 2018b). This ability forms the first branch of Mayer and Salovey's (1997) AEI model, and describes the ability to identify discrete emotions in others and oneself, requiring the individual to accurately attend, detect, and decipher emotional signals (Mayer et al., 1999). In addition, Gross (1989a) suggests that under stress, ER strategies that direct one's attention require the rapid and efficient selection of emotionally salient stimuli (Gross & Thompson, 2007; Yamaguchi & Onoda, 2012). It therefore seems plausible that for an individual to form an attentional bias for an emotion type, they need to be able to distinguish between different emotions. Thus, emotion perception ability was measured in the present study. Whereas stress reactivity and attentional processing relate to ER *during* the stressor, there are other forms of ER which occur *after* the stressor has ceased (i.e., post-event mental processes, such as rumination).

5.2.3 EI and post-event rumination

In Study 1, EI showed limited utility with respect to affective or physiological recovery, in the first five minutes following the stressful event (i.e., the Sing-a-Song Stress Test). It could be that a longer period of time is necessary to capture the effects of EI on those forms of post-stressor ER, and EI may instead relate to the deliberative *cognitive* processes of stress regulation that occur during that initial recovery period. Individuals draw on a variety of cognitive strategies as a way of coping with stress (Marroquín, Fontes, Scilleta, & Miranda, 2010). One such explicit, controlled ER strategy is rumination, which describes the process of focussing and brooding on negative emotions (e.g., thinking excessively about something upsetting a friend said), characterised by intrusive, repetitive, unwanted thoughts that interrupt ongoing activities and are difficult to control (Rachman, 1981). Unlike emotion-focussed coping, rumination is an ER strategy that more specifically relates to *negative* cognitions, whereby the negative thoughts involved are characterised as being persistent and intrusive (Smith & Alloy, 2009).

In contrast to mood repair and physiological recovery (which can take time), individuals tend to ruminate about a stressful event immediately after it has concluded (Kocovski, MacKenzie, & Rector, 2011; Morgan & Banerjee, 2008). Thus, the effects of EI on post-stressor rumination may be more likely to be detected in a time-restricted experimental paradigm than other forms of post-event processes (e.g., changes in negative affect [NA]). Put simply, those with superior emotional traits and skills may engage with more helpful ways of thinking after encountering a stressor.

The research concerning the implications of rumination for adaptation is extremely consistent. Compared to those who do not tend to ruminate (i.e., when rumination is conceptualised as a *trait*), individuals who ruminate more have a greater likelihood of developing internalising disorders, especially in adolescence (for meta-analysis, see Rood et al., 2009; Young & Dietrich, 2015). The extent to which people ruminate after a stressful event has important consequences for adaptation. As described in Chapter 3 (Section 3.3.3.2), evidence suggests that individuals who show high post-event rumination (i.e., those who ruminate more following a laboratory stressors) show not only exhibit impaired emotional and cortisol recovery (LeMoult et al., 2013; Stewart, Mazurka, Bond, Wynne-Edwards, & Harkness, 2013), but also heightened cardiovascular activity (Key et al., 2008). Ruminating about an event generally impairs one's ability to repair their mood following that event (Odou & Brinker, 2013; Odou & Brinker, 2014). Furthermore, some suggest that rumination may inhibit the individual's ability to shift attentional focus away from negative environmental stimuli, even after the threat has passed (Hilt et al., 2017; LeMoult et al., 2013; Stewart et al., 2013). In sum, ruminating is rarely a helpful stress regulation strategy.

Importantly, individuals differ markedly on the extent to which they ruminate after a stressful situation, leading to an important question: "why is it that following an emotional event, there are people who have more (or less) ruminative thoughts than others?" (Lanciano et al., 2010, p.67). Such differences in mental rumination could theoretically be related to differences in EI: if rumination is characterised by fixation on negative emotion, it would make sense that EI could be helpful in this regard. A wealth of evidence documents a relationship between TEI and positive emotionality, which is unsurprising given the positive constructs present in its nomological network (e.g., optimism, happiness, self-esteem) (see **Table 1**; **Figure 5;** Petrides et al., 2007). Indeed, evidence suggests higher TEI predicts a general tendency to ‘savour’ positive emotions, and to distract oneself from negative emotions (Gómez-Baya & Mendoza, 2018; Salovey et al., 2002; Szczygieł & Mikolajczak, 2017). Studies using the Trait Meta Mood Scale (TMMS) have also identified TEI can predict fewer intrusive thoughts following an experimental stressor, helping to repair mood (Ramos, Fernandez-Berrocal, & Extremera, 2007; Salovey et al., 1995). There is also nascent support for a link between high AEI and reduced rumination. Specifically, adaptive processing of intrusive and ruminative thoughts could be facilitated by emotion management skill (Lanciano et al., 2010). By engaging with higher level emotion-related cognitive processes, high AEI (EM) individuals could effectively buffer the effects of acute stress, and subsequently have more positive life outcomes than low AEI (EM) individuals. However, as is usually the case for EI studies that examine ER processes, research examining EI and post-event rumination has been conducted exclusively with adult samples.

Thus, there are clear research ‘gaps’: little research has been published on experimentally examined state rumination (i.e., rumination ‘in action’), even less on EI and state rumination, and none on EI and state rumination in adolescents. EI could enhance mental health outcomes for young people by employing adaptive cognitive strategies that combat rumination (i.e., by reducing the extent to which they dwell on everyday stressors). Furthermore, EI may exert that protective effect through interactions with other ER processes, such as speeding up psychological and physiological recovery, and supporting the ‘healthy’ attentional processing patterns outlined in the earlier “EI and Attention” section.

5.2.4 Aims and hypotheses

The present study contributes to knowledge in several ways. It is the first to examine the role of EI in attentional processing of emotion under stress in an adolescent population.

Furthermore, because the study shares common methodology with Study 1, findings can be used to ascertain whether the findings from Study 1 replicate. Third, it tests whether EI moderates post-stressor rumination, a hypothesis that has not yet been tested with adolescents. The study endeavours to be robust in all aspects of its methodology. Study 1 controlled for variables that had theoretically or empirically been found to influence stress reactivity (personality, cognitive ability, and mental health). As the present study was measuring both stress reactivity and attentional bias, those confounding influences were again measured and included as covariates in analyses.

The present study had three aims: to explore (1) the role of EI in the attentional processing of emotion under conditions of acute stress in adolescents, (2) the relationship between EI and post-stressor rumination, and (3) to replicate Study 1 regarding EI and reactivity. Predictions did not distinguish between TEI and AEI, due to the very limited evidence available EI and attentional processing under stress. First, TEI should predict less psychological (NA) and physiological (HR; EDA) reactivity under stressful conditions (**H1**). That first hypothesis will be tested twofold, using the sample from the present study, and in a larger sample (pooled reactivity data from Study 1 and Study 2). Second, EI should predict attentional bias *towards* threat (angry faces; sad faces; fearful faces) and *away* from happy faces under stressful conditions, and *towards* happy faces and *away* from threatening faces under control conditions (**H2**). Third, EI should predict lower levels of post-stressor rumination after the stressful task (**H3**). Akin to Study 1, exploratory analyses were also conducted, using TEI factor scores.

5.3 Method

5.3.1 Design

As with Study 1, Study 2 took an experimental, between-groups design (design choice is discussed in **Appendix A**), which comprised an online questionnaire battery, and an in-person experimental session. There were two independent variables in the experimental session: condition (randomly assigned; stressful vs. control) and EI (TEI, AEI [EM], AEI [EP]): continuous variables). Random assignment to conditions was carried out using an online random number generator (https://www.randomizer.org). There were 9 dependent variables. Eight dependent variables contained measures of attentional biases to emotion (i.e., happiness, sadness, anger), for both manual reaction time (RT) data, and eye movements. Three variables were measures of stress reactivity, indexed in the form of changes in mood (NA), HR, and EDA. Akin to Study 1, personality, cognitive ability, and mental health, were included as covariates in all analyses. Ethical approval was granted by the Humanities and Social Sciences Research Ethics Committee (HASSREC) at the University of Worcester in June 2018 (HASSREC code: HCA17180065).

5.3.2 Participants

An *a-priori* power analysis conducted using G*Power (Erdfelder et al., 1996) recommended that a minimum of 128 participants were required to achieve an 80% probability of detecting true effects using a hierarchical regression (Field, 2017), and this was used as the recruitment target for the study. However, as with Study 1, recruiting participants within a narrow age band (i.e., between the ages of 16 and 18 years) presented a challenge (largely due to difficulties in making direct contact with gate-keepers), and despite best efforts, a total of 70 adolescents were recruited. However, in light of the large number of dot probe trials (n = 192) per participant), and VanVoorhis and Morgan's (2007) suggestion of a minimum of 50 participants, this sample size was deemed sufficient for the purposes of the study. The participant recruitment process is hereby described. First, an email containing brief information about the study (**Appendix B**) were sent to head-teachers of 22 state and private Sixth Form colleges and secondary school Sixth Forms within a 20-mile radius of a major city in the West Midlands. Emails stated that the researcher would follow up with a phone-call 7 days later. If, during that phone-call, the head-teacher expressed an interest, a meeting was arranged to discuss the study particulars, attended by the researcher, head-teacher, and a member of the student support/safe-guarding team. Following consent to take part at institution-level, arrangements were made to recruit students to take part in the study (details provided in 'Procedure' section). Following consent to take part on a school-level, arrangements were made to recruit students for the study (details provided in 'Procedure' section).

Of the 22 schools and colleges that were initially contacted, two agreed to take part in the research. One of those sites was the same Sixth Form college from Study 1. However, it is important to note that the present study used a different cohort of students (i.e., each study used an independent participant group). The second site was a sixth form situated within a state high school. In most recent reports by Ofsted (the UK government office responsible for inspecting and regulating schools and colleges), both sixth forms were rated 'Good'. Ofsted also suggests that the West Midlands performs broadly in line with England as a whole at with respect to secondary and further education (Ofsted, 2014). As with Study 1, the ethnicity data obtained for the city within which the recruitment sites were situated revealed a comparable, though slightly lower, proportion of people with a Black and Ethnic

Minority origin (BME) (12.6%), than for the general population of England (20.2%) (UK Census, 2011).

Following the 22 initial emails, a further 11 emails were sent to colleges and schools within a 30-mile radius. However, due to difficulties recruiting sixth forms (in particular, non-responses to emails, and difficulties in making direct contact with head-teachers), a convenience sample of students (aged 16-18 years) from a local University was also recruited. Potential differences in maturity between sixth form students and University students were controlled for (see 'Subjective age' measure). The final sample consisted of students from a large state sixth form college (n = 44), a sixth form that formed part of a state secondary school (n = 6), and a University in the West Midlands (n = 10). To estimate general socioeconomic status (Ofsted is not relevant to higher education providers), the postcodes of the respective educational establishments were used to obtain 'neighbourhood level' Education, Skills and Training Deprivation (ESTD) indices. The ESTD is a domain of the English Indices of Deprivation, calculated using a number of objective indicators, including school attainment, school absence, staying in education, and entry to higher education (Smith, Noble, Noble, Wright, McLennan, & Plunkett, 2015). ESTD indices for the three sites were similar: most recent calculations (2015) placed the participating establishments in the 6th (n = 2) and 8th (n = 1) deciles, where decile 1 represents the 10% most deprived areas, and decile 10 represents the 10% least deprived areas (Office for National Statistics, 2015). Furthermore, during 2017/2018, when data collection took place, the mean percentage of students eligible for and claiming free school meals in state funded secondary schools and colleges for Worcestershire (9%) was only slightly less than for England as a whole (12.4%) (Department for Education, 2019). The prevalence of free school meal eligibility is a reliable proxy measure of disadvantage of an area (Kounali et al., 2008). Generally, statistics suggests that the sample was broadly representative of the UK population as a whole in terms of socioeconomic factors.

Of the 70 participants who provided consent, 60 completed both the online questionnaire battery and the experimental session. Those that completed both parts and those that did not did not vary significantly in either sex or age composition (*p*s > .05). The final study sample comprised 50 females and 8 males (2 participants selected 'Other'). 29, 19 and 12 students were 16, 17 and 18 years old respectively. None of the participants had taken part in Study 1.

5.3.3 Materials: Online questionnaire battery

To allow comparisons to be made with Study 1, six of the measures used for Study 1 were retained for Study 2 (**Table 12**). The following sections provide details of the Study 2 instruments not described in Study 1, with full copies available in **Appendix C**.

Table 12

Measures Used across Studies 1 and 2

Construct	Study 1 (Chapter 4)	Study 2 (Chapter 5)
TEI	TEIQue-ASF	TEIQue-ASF
AEI (understanding)	STEU-B	-
AEI (management)	STEM-B	STEM-B
AEI (perception)	-	Emotion recognition test
Personality	Mini-IPIP	Mini-IPIP
Cognitive ability	Vocabulary Test	Vocabulary Test
Mental health	HADS	HADS
Mood	PANAS	PANAS
Physiological stress	HR	HR; EDA
State coping	CITS-S	-
Post-stressor rumination	-	Thoughts Questionnaire

Note. TEI = trait emotional intelligence; TEIQue-ASF = Trait Emotional Intelligence Questionnaire – Adolescent Short Form (Petrides, 2009); AEI = ability emotional intelligence; STEU-B = Situational Test of Emotion Understanding- Brief (Allen et al., 2014); mini IPIP = mini International Personality Item Pool (Donnellan et al., 2006); HADS = Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983); PANAS = Positive and Negative Affect Schedule; HR = heart rate; EDA = electrodermal activity; CITS-S = Coping Inventory for Task-Based Stressors (Situational Version) (Matthews & Campbell, 1998).

5.3.3.1 Subjective age

There was a risk that, despite being in the same 16-18 age bracket, Sixth Form students could have differed from those who have recently started university, in terms of their emotional mind-sets and maturity (e.g., Fang & Galambos, 2014). To account for potential differences attributable to that phenomenon, participants were asked to indicate their *subjective age* (i.e., perceived maturity). Subjective age identity (SAE) was estimated from a single item: “Compared to most people my age, most of the time I feel…”, with answers rated on a 7-point scale from 1 (‘a lot younger’) to 7 (‘a lot older’). The item is frequently used on its own to examine adolescent subjective age (Arbeau, Galambos, & Jansson, 2007; Fang & Galambos, 2014; Hubley & Hultsch, 1994), and has shown consistently high item-total correlations (.61–.67) when used in multi-item SEA scales in adolescent samples (e.g., Galambos & Tilton-Weaver, 2000; Galambos, Barker, & Tilton-Weaver, 2003).

5.3.3.2 Emotional intelligence: ability

Study 2 builds on Study 1 by incorporating measurement of the experiential AEI branch. Proficiency in emotion perception (the ability to recognise and distinguish between emotions) could facilitate the adaptive attentional pathway assessed via the dot probe task. With the omission of the STEU-B (due to reliability issues), the strategic branch of AEI was assessed using via the STEM-B only. Since the most common and valid way of assessing emotion perception is by measuring how accurately participants identify which emotion is present in emotional stimuli, an emotion recognition test (ERT) was sought for the present study (Elfenbein & MacCann, 2017). A test that fulfilled three criteria was sought: 1) featured predominantly audiovisual stimuli (i.e., stimuli with both sound and visual components), 2) had the capacity to implemented online, and 3) was 10-15 minutes in length.

To achieve an ecologically valid representation of emotion, the first criterion was that the emotional stimuli be audiovisual. Although most emotion stimulus sets contain only static facial images (e.g., JACFEE; Matsumoto & Ekman, 1988; KDEF; Lundqvist, Flykt, & Ohman, 1998), static facial expressions are rarely observed in real life, and the assessment of facial movements often facilitates the process of deciphering emotion (e.g., Bould, Morris, & Wink, 2008, Pollick, Hill, Calder, & Paterson, 2003). Moreover, recent evidence suggests MSCEIT scores (which also uses static images) do not predict the ability of adolescents to recognise emotion from vocal tone (Davis, Morningstar, Dirks, & Qualter, 2020). Furthermore, while MSCEIT scores may predict recognition of dynamic facial emotion in adults, the effect does not extend beyond the effects of crystallized cognitive ability (Davis, Morningstar, & Qualter, 2020). These issues help highlight the importance of multisensory integration (i.e., sight *and* sound) during emotion perception (de Gelder & Bertelson, 2003; Kreifelts, Ethofer, & Wildgruber, 2007; Massaro & Egan, 1996).

Second, it was important for the ERT to have the capacity to be implemented effectively online, a necessity for its incorporation into the online portion of the study. Lastly, the test was required to be of suitable length (< 15 minutes total completion time) to reduce the risk of abandonment. While some ERTs met some criteria, they did not meet others. For example, the MSCEIT-Youth Research Version emotion perception scale uses static images (MSCEIT YRV; Mayer et al., 2014). The Geneva Emotion Recognition Test – Short (GERT-S; Schlegel & Scherer, 2015) appeared promising (audio-visual stimuli, 10 minutes long), but unfortunately posed many technical issues when embedded into the online questionnaire battery. Because a suitable test that satisfied all criteria could not be identified, a new ERT was developed for the purposes of the present study. It is common for EI researchers to develop bespoke scales and tasks to fit the purposes of the study (e.g., see Zysberg, Levy, & Zisberg, 2010). **Appendix J** provides details of how the ERT was developed, using stimuli from the Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS; Livingstone & Russo, 2018).

In the final ERT, participants viewed each of the 36 videos video in a random order, and chose the emotion they thought is being expressed from a choice of six. Responses were scored as either correct (1) or incorrect (0). Total scores (% correct) are computed for each participant by dividing the number of correct responses by the total number of responses provided, and then multiplying by 100. Results from a small pilot version of the ERT (n = 10) indicated its potential for use in the present study (data not shown). In the present study, participants achieved an average score of 76.60% (SD = 7.06).

5.3.4 Experimental session tasks and measures

5.3.4.1 Stress induction

The second part of the study entailed a face-to-face experimental session, with an identical stress induction procedure to that described in Study 1 (i.e., the Sing-a-Song Stress Test; SSST [stress condition] or reading task [control condition]; Chapter 4, Section 4.3.5). Stress reactivity and recovery variables were conceptualised in the same way, where reactivity was operationalised as the change in stress variables (i.e., NA, HR, EDA) from baseline to immediately after the stressor (**Table 6**). However, unlike Study 1 (which measured both PA and NA), only the NA subscale of the PANAS was used, to keep the in-person part of the study a reasonable length. Using change in NA as a single index for psychological stress reactivity is very common in the literature (see Davis, 2018b; Mikolajczak et al., 2009a , or for review, Lea et al., 2019), and also lowers the risk of Type I errors, via a reduction in the number of analyses performed. However, Study 2 measured physiological stress differently to Study 1: an Empatica E4 wristband (Empatica, US) was used to track physiological changes over the course of the experiment. The E4 is a portable, photoplethysmographic device that provides high quality physiological recordings that include EDA, HR, Blood Volume Pulse (BVP), acceleration (motion-based activity), and temperature. The E4 HR and EDA signals show good stress discrimination power under laboratory conditions (e.g., Simon, Godin, Campagne, & Charbonnier, 2016), and also show promising application potential in several clinical areas, including the detection of migraines and epileptic seizures (Onorati et al., 2017; Siirtola, Koskimäki, Mönttinen, & Röning, 2018). Qualitative data has also indicated that participants view the device as non-obtrusive (Lo, Sehic, & Meijer, 2017), further supporting its use with adolescents in the present study.

5.3.4.2 Attentional bias

Attentional bias was measured using a dot-probe paradigm developed by Davis (2018b), the only other study to measure the relationship between EI and attentional bias under stress using eye-tracking. Immediately after the SSST, participants took part in a visual dot-probe task to assess their attentional bias for emotional stimuli over neutral stimuli. In the standard visual dot-probe paradigm (MacLeod et al., 1986), two stimuli (cues) that differ in their emotional content (e.g., threatening versus neutral) are presented simultaneously, followed by the presentation of a probe (normally a triangle or other symbol). Participants then indicate the location of the probe as quickly and accurately as possible through keypress. Response to the ‘attended’ location (i.e., the location the participant is focussing on) is usually faster. Thus, it is presumed that the difference in reaction time (RT) between congruent (when the probe appears at the same location as the emotional stimulus), and incongruent trials (probe and emotional stimuli at different locations) reflects attentional allocation (Bar-Haim et al., 2007). If an individual shows a shorter average RT to congruent stimuli, this indicates an attentional bias towards emotional stimuli. In contrast, shorter RTs in response to incongruent stimuli indicate avoidance of emotional stimuli.

Dot-probe paradigms offer advantages over other tasks used to assess selective attention. In the emotional Stroop task, participants name the ink colour of words, presented one at a time, as quickly as possible (Stroop, 1935). Normally, words are from two categories of different valence (e.g., threatening versus neutral). The result of longer naming latencies to ink colours of one group of words over another indicates an attentional bias. However, attention researchers have emphasised that the Stroop task may engage mechanisms other than attention, with effects instead reflecting differences in language and colour processing speeds, for example (for discussion, see Starzomska, 2017). In contrast, dot-probe paradigms offer a more direct, and methodologically robust, test of attentional bias, with less potential for interference from other information processing systems (Mogg & Bradley, 1998). To capture continuous attentional deployment prior to the onset of the probe, manual RTs can be coupled with eye movement data to provide a multi-dimensional, robust assessment of attentional bias under stress (Davis, 2018b). One approach is to measure which stimuli type participants tend to fixate on first (i.e., emotional, or neutral), whereby more first fixations on emotional stimuli (e.g., happy, sad, angry) than neutral indicate greater attentional allocation to that emotion type. The present study used a dot-probe paradigm where attentional bias was indexed by 1) manual RTs (captured through key press responses), and 2) first fixations (captured through eye-tracking). Dwell time was not measured in the present study due to equipment limitations, but is noted as a potential future direction in the Chapter discussion.

5.3.4.2.1 Dot-probe task

In experimental contexts, ‘threat’ is usually operationalised as stimuli with negative valence (e.g., angry or fearful faces; Davis, 2018b). The dot-probe paradigm for the present study was constructed and presented in OpenSesame, an open-source experiment builder (Mathôt, Schreij, & Theeuwes, 2012), using facial emotion stimuli from the NimStim Set of Facial Expressions (Tottenham et al., 2009). The NimStim repository contains 672 images of 43 ethnically diverse professional actors, each modelling eight different facial emotions: happy, sad, angry, fearful, surprised, disgusted, neutral, and calm (see **Figure 11**).

Figure 11

Examples of Four Emotional Displays for a Female Actor from the NimStim Dataset

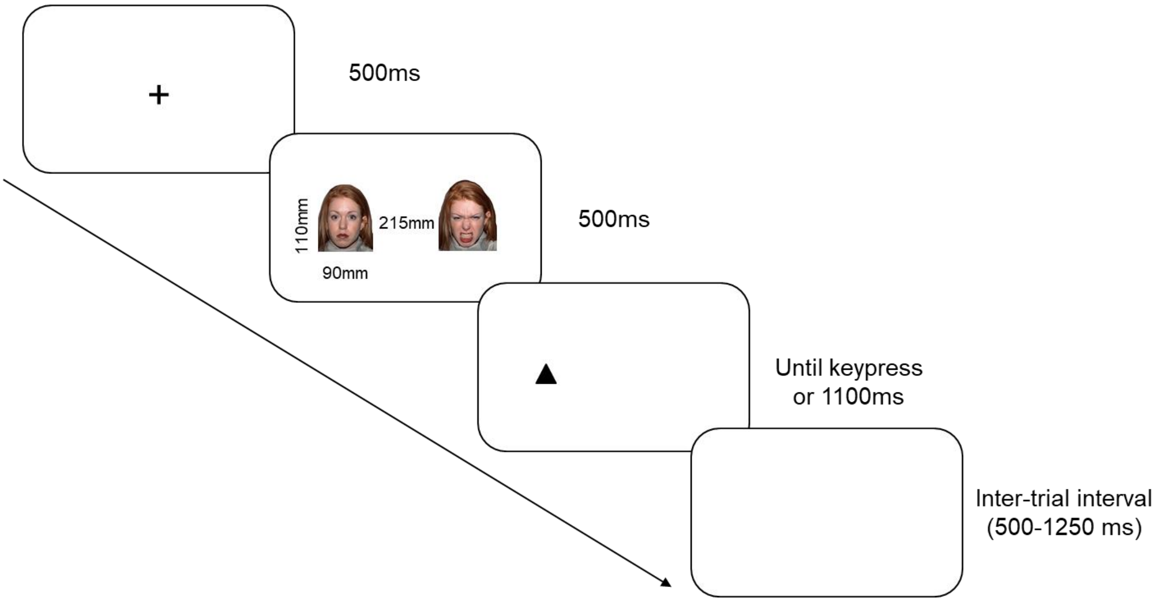
Notes. Emotions: neutral (top left), happy (top right), sad (bottom left), angry (bottom right). Source: Tottenham et al., 2009).

NimStim images have good levels of reliability (αs are around .84) and validity (Tottenham et al., 2009), and have been used for emotional stimuli in numerous eye-tracking studies (e.g., Davis, 2018b; Hilt et al., 2017; Wieckowski, Capriola-Hall, Elias, Ollendick, & White, 2018). 112 pairs of images were constructed, consisting of 32 angry-neutral pairs, 32 happy-neutral pairs, 32 sad-neutral pairs, and 16 neutral-neutral pairs (for practice trials). Each pairing used expressions from the same actor (e.g., for an angry-neutral pair, an image of an actor showing an angry expression, would be presented alongside another image of the same actor, but with a neutral expression). Images measured 90mm (width) x 110mm (height) and were spaced 215mm apart from the image centres, set against a white background (**Figure 12**). Following the practice session, stimuli were presented twice, across two blocks, producing 192 experimental trials in total.

The dot-probe method, NimStim images, and timings were identical those described in Davis (2018b), the only other study to measure the influence of EI on attentional bias under stress using eye-tracking. Trials began with the presentation of a central fixation cross

Figure 12

Procedure and Dimensions Used for the Dot-Probe Task



Note. An incongruent trial is shown (i.e., emotional face and probe locations are different).

(500ms), followed by a face pair (500ms) (**Figure 12**). With the offset of the image pair, a probe stimulus (triangle) immediately appeared in the location previously occupied by one of the faces (neutral or emotional face) for 1100ms, or until a key press response was detected. The emotional face, and the probe, each appeared on the left/right hand side of the screen with equal frequency. Thus, half of the trials were congruent (i.e., the emotional face appeared on the same side as the probe), and half were incongruent (i.e., the emotional face appeared on the opposite side to the probe). Image pairings were presented in a random order. Participants were instructed first focus on the fixation cross, and then to identify the location of the probe as quickly as possible by pressing either A (left) or L (right). RT was recorded for the interval between the onset of the probe and the key press response. The inter-trial interval had a randomised duration of between 750 and 1250ms (using 10s increments).

5.3.4.2.2 Eye-tracking technology

A mobile Eye Tribe eye-tracker (Eye Tribe, Denmark) recorded participants' eye movements continuously for each trial at a temporal resolution of 30Hz, and an accuracy of between .5 and 1º visual angle, corresponding to on-screen average error of 0.5 to 1 cm. The EyeTribe eye-tracker is capable of running at two frame rates: 30Hz and 60Hz. Whilst recording at 60Hz enables faster processing of eye movements, recording at high resolution reduces the trackable screen area and allows for less head movements. Since data was collected in non-laboratory environments (i.e., classrooms, where head movements were not restricted), the 30Hz frame rate was selected to mitigate data loss (EyeTribe, 2014). Evidence generally indicates that given the equipment is set up correctly, the accuracy and precision of Eye Tribe data is comparable to that of more established models, despite being classed as a 'budget' eye-tracker (Ooms, Lapon, Dupont, & Popelka, 2015). Whilst using the Eye Tribe for testing high-accuracy saccade metrics is cautioned against, it is well-suited for fixation investigations, even at 30Hz (Dalmaijer, 2014). Thus, the device was deemed fit for the purpose of the present study: to capture the direction of the first fixation (i.e., emotional or neutral face) following the offset of the central fixation cross. For each participant, the seat and screen height were adjusted such that the participant's eye height met the centre of the screen. The distance between the participants' eyes and the screen was approximately 60 cm. The eye-tracker was calibrated for each participant using a 9-point visual display at the start of the task. In total, the dot-probe task took approximately 12 minutes to complete.

5.3.4.3 Post-event rumination

The extent to which participants ruminated about their stressful task performance was assessed via an adapted version of the negative subscale of the Thoughts Questionnaire

(Edwards, Rapee & Franklin, 2003) (**Appendix C**). In contrast to the majority of rumination instruments, which measure *trait* rumination (i.e., the tendency of an individual to ruminate in general; e.g., the Rumination Responses Scale; Nolen-Hoeksema, Larson, & Grayson, 1999), the Thoughts Questionnaire measures *state* rumination (i.e., short-term rumination in response to an acute stressor). The scale lists 15 negative thoughts relating to the task. Participants rated each statement according to how often they thought about certain aspects of the task since its end, using a 5-point scale ranging from "Not at all" (0) to "Very often" (4). Example items included "I must have looked stupid" and "How awkward I felt". Items are summed to produce a post-event rumination score. This questionnaire was highly reliable (.93) when used to assess ruminating thoughts following participation in the Trier Social Stress Test, another psychosocial stressor (Zoccola, Quas & Yim, 2010). Although participants in both experimental conditions completed the measure, minor changes were made to the wording of 2 items to ensure applicability to each task (e.g., for item 5: "How bad my singing was" [experimental group] versus "how bad my understanding of the article was" [control group]). Whilst the questionnaire has not been tested with adolescents aged 16-18 years, a small pilot sample (n = 7) confirmed measure readability. In the present study, the measure was proved to be highly reliable in both the experimental (.94), and the control conditions (.91).

5.3.5 Procedure

As with Study 2, the researcher visited seven AS and A2 level[3] Psychology classes across the two participating sixth form colleges, giving talks that lasted for approximately 15 minutes to introduce the study to students and hand out information packs (see **Appendix F** for

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[3] AS and A levels are subject-specific qualifications taken by students aged 16-18 years in the UK (except Scotland)

information sheet and consent form). During this time, the researcher introduced herself to the students, gave a brief PowerPoint presentation that highlighted the benefits and risks of participating in research, and provided a brief outline of the study. Information packs containing an information sheet, letter to parents, and consent form, were then handed out. These talks were arranged by liaising directly with Psychology teachers directly, and usually took place at the end of timetabled lessons. Individual student involvement was contingent upon the return of the opt-in consent form (co-signed by both the student and their parent/guardian). Participants indicated their email address on their consent form; the information sheet reassured them that they would only be contacted for the purposes of recruitment and arranging time-slots. Email addresses were stored in a spreadsheet on the researcher's password-protected laptop and were not included in datasets containing responses, to preserve anonymity. Within one week after written consent was obtained from sixth form students, participants received an email containing an individual link to the online portion of the study. The researcher also delivered the same study information talk to first year Psychology undergraduates during start-of-semester introductory lectures. However, because parental consent was not required for those students (all were over the age of 18), they were instead instructed to contact the researcher by email if they were interested in taking part. A link to the study was then sent via email.

The first step of the online survey, after reading the Information Sheet and consent form (**Appendix B**), asked participants to generate a six-digit ID, using the last two letters of their surname, month of birth, and the last two digits of their phone number (e.g., if the participant's name was John Smith, they were born in June, and their phone number ended in 11, their participant ID would be TH0611). Participants completed the questionnaire battery, containing the ERT, TEIQue-ASF, STEM, IPIP, HADS, and the vocabulary test (all hosted on Qualtrics.com). Participants also indicated their age, subjective age, and sex. Measures were presented in a random order to counteract order effects (Lavrakas, 2008). Participants could stop and resume the questionnaires at any point over 10 days. Throughout this time, two email reminders were sent out to participants who had not completed all questions. The battery took approximately 25 minutes to complete.

Approximately one week after completion of completion of the questionnaire battery, participants were sent an email with a link to a Doodle Poll web page to choose a convenient time slot for the in-person experimental session. Data collection took place in unused classrooms within the college (sixth form students), or the university (undergraduate students). The stress induction procedure was identical to that described for Study 1 (i.e., stress group: SSST; control group: neutral magazine article: see **Appendix E**). Immediately afterwards, participants started the dot-probe task. Subjective mood was captured at three time points: at the start of the experiment (baseline), immediately after the stressful task or control task (reactivity), and halfway through the eye-tracking task (recovery; approximately six minutes after the SSST). Time-points were the same as those used in Study 1, and in similar studies (e.g., Ling et al., 2018; Liu et al., 2017; Pittarello et al., 2018; see **Table 6**). Physiological responses were captured at time-matched points. At the end of the experiment, participants watched the same comedic video from Study 1 - which had been shown to significantly decrease levels of NA - to reduce remaining stress. Participants were then debriefed, thanked for their participation, and asked not to disclose details of the experiment of with other participants in order to maintain study integrity. The experiment lasted approximately 45 minutes. Data collection for the present study took place between October 2018 and February 2019.

5.4 Results

5.4.1 Analysis plan

To check the stress induction procedure was successful, three 2 (condition: stressful vs. control) x 2 (time: before vs. during task) repeated measures ANOVAs were performed for NA, EDA, and HR. For the reactivity analyses, the analytic strategy mirrored that of Study 1 (based on the strategy of Matthews et al., 2006), whereby separate hierarchical regressions were performed, with either NA, HR, or EDA as criterion. The same covariates as Study 1 (Big Five personality traits, cognitive ability, trait anxiety, and trait depression, along with their product vectors representing conditional effects), were also entered into the models. For the attentional bias analyses, hierarchical regressions were run to test whether EI predicted attentional bias to different emotions, with either a) manual reaction times, or b) eye movements (first fixations) as criterion. Task condition was entered in step 1. The covariates outlined above, along with their product vectors, were also included in the models at steps 2 and 3 respectively, followed by EI (step 4) and EI x condition (step 5). Rumination regressions used same components as the above models, but with post-event rumination as criterion. EI was operationalised as a continuous variable in all analyses, Bonferroni adjustments were not made, and exploratory analyses were carried out for TEI subscales, akin to Study 1. As alluded to in the Analysis Plan for Study 1, the achieved sample size was not sufficient to conduct SEM analyses, which typically require a minimum of 200-300 participants (e.g., Kline, 2011; Kyriazos, 2018; Tabachnick & Fidell, 2014).

5.4.2 Data screening and preparation

Of the 70 students that consented to take part in the study, 67 students completed the online questionnaire battery, and 60 of those also completed the experiment. The 7 participants that completed the online questionnaire battery and 60 participants that completed the entire study did not differ systematically in terms of TEI, AEI, personality, cognitive ability, or mental health (independent samples *t*-tests for completions vs. non-completions all showed *p*s > .05). There were also no significant differences in age or sex composition (*p*s > .05). The dataset for those 60 participants was complete with the exception of eye-tracking responses for 3 participants, because the eye-tracker could not calibrate to their eye movements, even after ruling out technical issues. A failure to calibrate can be caused by numerous naturally occurring individual factors, including droopy eyelids, downward lashes, ocular dominance, or if eyes are particularly dry or wet (Holmqvist & Andersson, 2017). Data for those participants was subsequently used on a pairwise basis.

5.4.2.1 Preparation of manual reaction time (RT) data

In line with previous research (Davis, 2018b), the complete data set of 11,520 experimental trials (60 participants x 192 trials) was screened for incorrect responses (i.e., keypress did not correctly identify the location of the probe) and outliers (+/- 2 *SD* from the mean RT of 423.67 ms). For each participant, emotion bias scores for each emotion type (happy, angry, sad), were computed according to established methodology (Bradley, Mogg, Falla, & Hamilton, 1998), whereby the mean RT to congruent stimuli (where the emotional face appears in the same position as the probe) is subtracted from the mean RT to incongruent stimuli (where the emotional face and the probe appear in different locations). For example, the bias score for sad faces = mean RT to congruent stimuli (sad face on the same side as the probe) – mean RT to incongruent stimuli (sad face on different side to the probe). Scores with a positive value represent a bias towards that emotion type, whereas a negative value represents a bias away from that emotion type (zero = no bias). Mean RTs for incongruent and congruent stimuli, by emotion type and condition, are given in **Table 13**.

Table 13

Manual Reaction Times to Face Stimuli as a Function of Experimental Condition and Emotion

		Experimental condition	
Stimuli type	Emotion type	Stress *M* (*SD*)	Control *M* (*SD*)
Congruent	Angry	429.79 (75.97)	414.48 (127.41)
	Sad	416.99 (64.13)	419.40 (121.35)
	Happy	418.14 (70.93)	423.57 (132.87)
Incongruent	Angry	422.95 (68.75)	418.50 (125.10)
	Sad	423.77 (72.11)	414.50 (125.71)
	Happy	424.31 (72.07)	423.65 (132.18)

Note. *M* = mean; *SD* = standard deviation; *N* = 31 (stress), *N* = 29 (control); congruent stimuli = probe and emotional face in same position; incongruent stimuli = probe and emotional face in different positions.

Mean bias scores for each emotion type, across experimental conditions are provided in **Appendix K**. Only bias for sad faces differed according to experimental group, whereby participants in the stress group showed a bias *for* sad faces (> .5), whereas those in the control group showed a bias *away* from sad faces (< .5).

5.4.2.2 Preparation of eye movement data

For each trial, the EyeTribe used an algorithm to record whether a fixation occurred for each of 15 equally spaced time-points throughout the 500ms presentation of the face pair, and the screen coordinates for which gaze was directed at that time-point (x,y). Thus, the experiment returned an eye-tracking file for all 192 trials, for each participant (approximately 40,000 rows). The file was imported into RStudio version 1.2.1335. First, eye movements that occurred < 100 ms after the onset of the face pair were filtered out, as these 'anticipatory' fixations typically occur independently of emotional stimuli (Mogg et al., 2004). Second, code was developed to record the coordinates of the *first* fixation for each trial. Remaining analyses were conducted in Microsoft Excel (2016) and SPSS v26. The first fixation coordinates were cross-referenced with the locations of the on-screen images (left image: x = 110.25 to 489.75, y = 150 to 618; right image: x = 534.25 to 913.75, y = 150 to 618, where the origin, 0,0 is the top left of the screen) to determine whether the first fixation was on the left image, right image, or neither of the images (i.e., on the white space surrounding the images, or off-screen). The emotion of first fixation (i.e., happy, sad, angry) and gaze direction (i.e., towards/away) could then be deduced by corresponding the 'left' and 'right' fixations for each trial with the order of image presentation information provided in OpenSesame RT output file. The mean number of first fixations to each type of emotion stimulus, across experimental conditions, is shown in **Table 14**.

To establish attentional bias scores for each emotion type, the number of first fixations to that emotion type was divided by the total number of trials where a fixation was made during emotion-neutral pairings of that emotion type (Davis, 2018b). For example, bias for happy faces = number of first fixations to happy faces/total number of first

Table 14

Mean Number of First Fixations to Face Stimuli as a Function of Experimental Condition

		Experimental condition	
Gaze direction	Emotion type	Stress *M* (*SD*)	Control *M* (*SD*)
Towards	Angry	15.97 (5.83)	16.71 (6.40)
	Sad	16.55 (6.36)	15.82 (5.59)
	Happy	14.97 (6.32)	16.07 (6.20)
Away	Angry	17.10 (6.60)	16.11 (6.45)
	Sad	16.69 (5.65)	16.75 (6.19)
	Happy	17.55 (6.69)	17.18 (5.99)

Note. *M* = mean; *SD* = standard deviation; *N* = 31 (stress), *N* = 29 (control).

fixations made in trials with happy-neutral face pairings. Scores of more than .50 represent a bias *towards* that emotion type, whereas scores of less than .50 represent a bias away from that emotion type. Bias towards emotion types did not differ according to experimental condition (**Appendix K**).

5.4.3 Preliminary analyses

Key assumptions for running hierarchical regressions were not violated in any of the analyses (Field, 2017). The assumption of normality was met, as assessed by a Q-Q Plots, and independence of residuals was demonstrated by Durbin-Watson values being close to 2.

Linear relationships were shown between the dependent and independent variables collectively (as assessed by visual inspection of scatterplots of studentized residuals versus unstandardized predicted values), and between the dependent variable and each of the independent variables (as assessed by visual inspection of partial regression plots). There were no notable multivariate or univariate outliers with z-scores ± 3.29 SD from the mean, and multicollinearity was minimised through the use of mean-centred variables. Whole-sample statistics (including means, standard deviation, range, reliability indices, skew, and kurtosis) for the online measures are provided in **Table 15**.

The data was probed for any pre-existing differences between experimental groups in terms of age, sex, and independent variable scores. Randomly allocated experimental groups did not differ according to: age ($\chi(2) = 1.56$, $p = .466$), sex ($\chi(2) = 2.26$, $p = .328$), TEI ($t(58) = -1.02$, $p = .312$), emotional management ($t(58) = -.66$, $p = .510$), emotion perception ($t(58) = -.49$, $p = .625$), Big Five factor scores (*t*s < 1.30, *p*s <.05), cognitive ability ($t(58) = -.12$, $p = .234$), trait anxiety ($t(58) = .08$, $p = .941$), or trait depression ($t(58) = 1.76$, $p = .092$).

5.4.4 Relationships between study variables

Table 15 displays whole-sample descriptive statistics and bivariate intercorrelations for the questionnaire battery variables (TEI, AEI, personality dimensions, cognitive ability, depression, anxiety). Expectedly, findings broadly mirrored those of Study 1, whereby all constructs were related to at least one TEI or AEI scale (or subfactor), with the exception of cognitive ability ($p > .05$). Trait neuroticism was the only questionnaire variable that differed between sexes ($t(63) = 2.70$, $p = .007$), where females scored more highly ($M = 14.52$, $SD = 3.38$) than males ($M = 11.11$, $SD = 3.69$). Subsequent main analyses controlled for the effects of sex, personality, cognitive ability, and mental health, as a precautionary measure.

Table 15

Correlations and Whole-Sample Descriptive statistics for EI, Personality, Cognitive Ability and Mental Health (N = 65)

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	**.76*** **	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	**.67*** **	**.40** **	-	-	-	-	-	-	-	-	-	-	-	-	-
4. TEI: SO	**.52*** **	**.34** **	-.01	-	-	-	-	-	-	-	-	-	-	-	-
5. TEI: WB	**.89*** **	**.53*** **	**.50*** **	**.43*** **	-	-	-	-	-	-	-	-	-	-	-
6. AEI: EM	.14	**.27* **	.12	.03	.03	-	-	-	-	-	-	-	-	-	-
7. AEI: EP	-.17	-.06	-.13	**-.26* **	-.16	.04	-	-	-	-	-	-	-	-	-
8. O	-.05	.12	-.03	-.13	-.12	.09	.05	-	-	-	-	-	-	-	-
9. C	**.32** **	.22	**.34** **	.01	**.28* **	.06	.04	-.05	-	-	-	-	-	-	-
10. E	.13	-.02	-.16	**.51*** **	.09	-.12	.11	.11	-.11	-	-	-	-	-	-
11. A	.31*	**.54*** **	.54***	.17	.09	.18	-.07	.21	.06	.10	-	-	-	-	-
12. N	**-.55*** **	-.19	**-.60*** **	-.14	**-.56*** **	.15	.09	.24	-.20	-.01	.13	-	-	-	-
13. GC	-.04	.01	.09	.11	-.05	.10	.12	.24	.02	.03	.10	-.08	-	-	-
14. ANX	**-.67*** **	**-.34** **	**-.57*** **	-.22	**-.68*** **	.17	.10	.17	-.22	-.10	-.08	**.64*** **	-.02	-	-
15. DEP	**-.63*** **	**-.43*** **	**-.46*** **	-.24	**-.64*** **	-.02	.00	-.11	**-.29* **	.03	**-.33** **	**.34** **	-.14	**.55*** **	-
M	4.37	4.56	3.80	5.01	4.23	10.57	76.52	14.62	13.05	12.11	15.62	14.05	61.11	17.02	12.25
(*SD*)	(0.77)	(.94)	(.96)	(0.72)	(1.49)	(2.11)	(7.04)	(2.91)	(3.13)	(4.09)	(3.63)	(3.60)	(19.00)	(4.36)	(3.08)
Range	2.43 –	2.13 –	1.83 –	3.00 -	1.00 –	4,25 –	50.00 –	8.00 –	6.00 –	5.00 –	4.00 –	4.00 –	11.11 –	9.00 –	7.00 –
	5.97	6.63	6.17	6.33	7.00	13.83	91.67	20.00	19.00	20.00	20.00	20.00	100	27.00	23.00
Skew	-.13	-.19	.13	-.46	-.19	-.83	-.86	-.35	.13	-.10	-1.11	-.44	-.05	.50	.95
Kurtosis	-.34	-.10	-.04	.03	-.93	.74	2.08	.05	-.47	-1.07	1.10	.04	-.38	-.44	1.20
α	.88	.68	.53	.51	.76	.64	NA	.65	.56	.84	.80	.73	.74	.84	.73

Notes. TEI = Trait emotional intelligence; EM = Emotionality; SC = Self-control; SO = Sociability; WB = Wellbeing; AEI = Ability emotional intelligence; AEI (EM) = Emotional management; AEI (EP) = Emotion perception; O = Openness; C = Conscientiousness; E = Extraversion; A = Agreeableness; N = Neuroticism; GC = Crystallised intelligence; ANX = Trait anxiety; DEP = Trait depression; M = mean, SD = standard deviation, α = Cronbach's alpha coefficient.

Baseline mood and physiology (i.e., NA1, HR1) were also controlled for when performing reactivity analyses. Sex differences were not assessed due to the considerable imbalance in numbers (females: 50; males: 8; other: 2). Correlations and whole-sample descriptive statistics for EI and all stress outcomes (for stressful and control conditions) are located in **Appendix L.**

5.4.5 Stress manipulation check

As with Study 1, the stress manipulation procedure was highly successful. The stress manipulation was analysed in an identical manner to Study 1 (Chapter 4). Participants in the stress condition experienced a significant increase in NA (M_{change} = 8.07, *SD* = 4.89, *t*(1, 30) = 9.19, *p* < .001), whereas those in the control group underwent a slight NA decrease (M_{change} = -1.14, *SD* = 2.72, *t*(1, 28) = -2.25, *p* = .032). The stressful task, but not the control task (*p* > .05), also induced a significant HR increase of 18.68% (M_{change} = 14.57 bpm, *SD* = 17.09, *t*(1, 30) = 4.77, *p* < .001). As changes in EDA can emerge *after* HR changes (e.g., Posada-Quintero et al., 2018), the effect of group (experiment vs. control) on % EDA change from baseline was assessed at 3 time-points (during singing task, 1 minute post-singing, and 2 minute post-singing) via separate ANOVA analyses. Significant differences in EDA change were only observed after 1 minute post-singing (*F*(1,56 = 5.62, *p* = .021): participants in the stress condition experienced an average EDA increase of 249.12%, compared to only a 56.86% change in the control group. Thus, the SSST was effective in inducing psychological (NA) and physiological stress (HR, EDA).

H1: EI will predict reduced psychological and physiological reactivity under stressful conditions

5.4.6 Effects of EI on stress reactivity

5.4.6.1 TEI and stress reactivity

Separate hierarchical regressions were conducted to test whether TEI improved the prediction of NA, HR, or EDA change, when the values of confounding influences were held constant. In the same manner as for Study 1, baseline stress variables (step 1), and experimental condition (step 2) predicted all outcomes. To avoid repetition of the mood manipulation analysis, only findings relating step 3 onwards are reported.

For the prediction of **NA**, results broadly replicated those of Study 1. Entering the covariates did not significantly improve the model at step 3 (ΔR^2 = .02, p = .965). The subsequent addition of global TEI (ΔR^2 = .001, p = .644) and TEI x condition (ΔR^2 = .01, p = .154) also failed to significantly increase of R^2. However, in contrast to Study 1, global TEI did not predict **HR** reactivity (ΔR^2 = .203, p = .060). Similarly, TEI (ΔR^2 = .003, p = .570), nor the TEI x condition, significantly increased R^2 (ΔR^2 = .015, p = .212). At the final step, only scores on the depression subscale of the HADS predicted HR reactivity (β = -1.32, p < .01). However, the relationship between depression and HR change was dependent on the experimental condition, since the depression x condition predictor was also significant (β = .1.26, p < .01). Depression predicted larger HR responses in the stress condition, but had no effect in the control condition. Global TEI also failed to predict **EDA** reactivity, either as a main effect (ΔR^2 = .00, p = .386), or as a product vector (ΔR^2 = .01, p = .093).

Exploratory analyses were run with TEI factor scores. While their addition did not improve model fit for **NA** reactivity (ΔR^2 = .02, p = .962), trait sociability score (β = -.91, p = .010), and the interaction between sociability and condition (β = .88, p = .030) remained significant predictors in the final model. To probe this finding further, the model was re-run without the other subfactors and their interaction terms (Field, 2017). Simple slopes analysis revealed that there was a statistically significant negative relationship (b = -2.19, SE = .93) between trait sociability and NA reactivity in the stress condition (p = .020). In contrast, the relationship (b = .86, SE = .96) between trait sociability and NA reactivity in the control condition was not significant (p = .375); none of the four TEI factor scores (ΔR^2 = .01, p > .05) or their conditional effects (ΔR^2 = .57, p > .05) predicted **HR** reactivity.

Similarly, **EDA** reactivity could not be predicted using any of the TEI subfactors (R^2 change = .01, p > .05) or product scores (ΔR^2 = .01, p > .05). Overall, TEI did not predict either mood or physiological reactivity. Only the sociability factor played a significant role: higher scores predicted less mood deterioration in the stress condition. Reactivity analyses for TEI are summarised in **Tables 16** and **17**.

5.4.6.2 AEI and stress reactivity

Findings regarding covariates are identical to those reported for the TEI analyses above, and are thus omitted. Akin to the TEI analyses, separate hierarchical regressions were conducted to determine whether AEI (EM) or AEI (EP) predicted NA or HR change. AEI did not predict either NA or HR reactivity (consistent with findings from Study 1 and Study 2). Reactivity analyses for TEI are summarised in **Tables 8** and **9**.

Table 16

Summary Statistics for Regressions of Stress Reactivity onto Pretask state, Condition, Personality, Cognitive ability, Mental Health, and Global TEI Predictors

	Step 1: Pretask state		Step 2: Condition			Step 3: FFM, cognitive ability, mental health			Step 4: TEI			Step 5: TEI x condition interaction			Significant EI and covariate predictors (at Step 5)
Criterion	R^2	$F(1,58)$	R^2	ΔR^2	$\Delta F(1,57)$	R^2	ΔR^2	$\Delta F(10,47)$	R^2	ΔR^2	$\Delta F(1,46)$	R^2	ΔR^2	$\Delta F(1,45)$	
NA	.21	**15.80***	.67	.46	**79.33***	.69	.02	.35	.70	.01	.23	.71	.01	2.15	None
HR	.22	**16.67***	.37	.15	**12.76***	.57	.20	1.97	.57	.00	.33	.59	.02	1.64	DEP (β = -1.32**) DEP x Condition (β = 1.26**)
EDA	.81	**232.42***	.81	.00	1.69	.84	.03	.85	.84	.00	.79	.85	.01	3.00	None

Note. NA = negative affect; HR = heart rate; 2; EDA = electrodermal activity; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; DEP = trait depression. ** = p < .01; *** = p < .001.

Table 17

Summary Statistics for Regressions of Stress Reactivity onto Pretask state, Condition, Personality, Cognitive Ability, Mental health, and TEI Subfactor Predictors

	Step 1: Pretask state		Step 2: Condition			Step 3: FFM, cognitive ability, mental health			Step 4: Emotionality, Self-Control, Sociability, Well-being			Step 5: Subfactor x condition interactions			Significant EI and covariate predictors (at Step 5)
Criterion	R^2	$F(1,56)$	R^2	ΔR^2	$\Delta F(1,57)$	R^2	ΔR^2	$\Delta F(10,47)$	R^2	ΔR^2	$\Delta F(4,43)$	R^2	ΔR^2	$\Delta F(4,39)$	
NA	.21	**15.80*** **	.67	.46	**79.33*** **	.69	.02	.35	.72	.03	.90	.76	.04	1.62	SOC (β = -.91*) SOC x Condition (β = .88*)
HR	.22	**16.67*** **	.37	.15	**12.76*** **	.57	.20	1.97	.57	.00	.13	.62	.05	1.14	DEP (β = -1.55**) DEP x Condition (β = 1.51**)
EDA	.81	**232.42*** **	.81	.00	1.69	.84	.03	.85	.85	.01	.91	.87	.02	.70	None

Note. NA = negative affect; HR = heart rate; EDA = electrodermal activity; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; SOC = TEI (sociability factor); DEP = trait depression. * = $p < .01$; ** = $p < .01$; *** = $p < .001$.

5.4.6.3 EI and stress reactivity: Pooled sample

The full set of findings from the pooled sample from Studies 1 and 2 is provided in **Appendix M.** In general, those findings were a combination of those obtained from the separate Study 1 and 2 samples. In the stress group, global TEI predicted less NA reactivity (it did not in Study 1 or 2 separately). A more detailed investigation into TEI's component factors revealed that, under stress, the TEI **sociability** subfactor predicted **less NA reactivity** (supporting Study 2) and **less HR reactivity** (supporting Study 1) (**Figure 13**). AEI did not predict either NA or HR reactivity (consistent with findings from Study 1 and Study 2).

H2: EI will predict attentional bias to threat under stressful conditions, and away from threat under control conditions

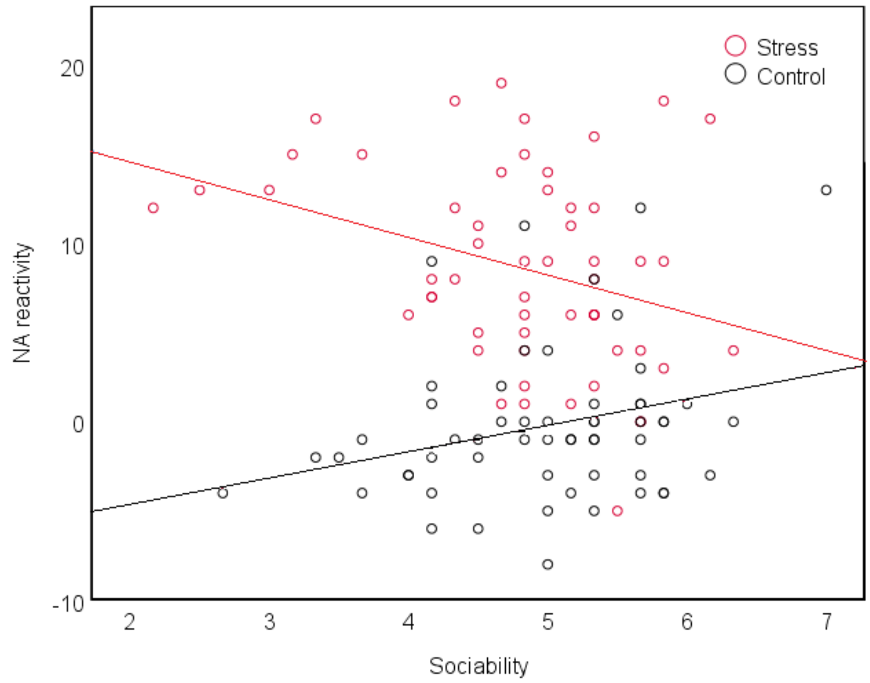
5.4.7 EI and attentional bias: Reaction time data

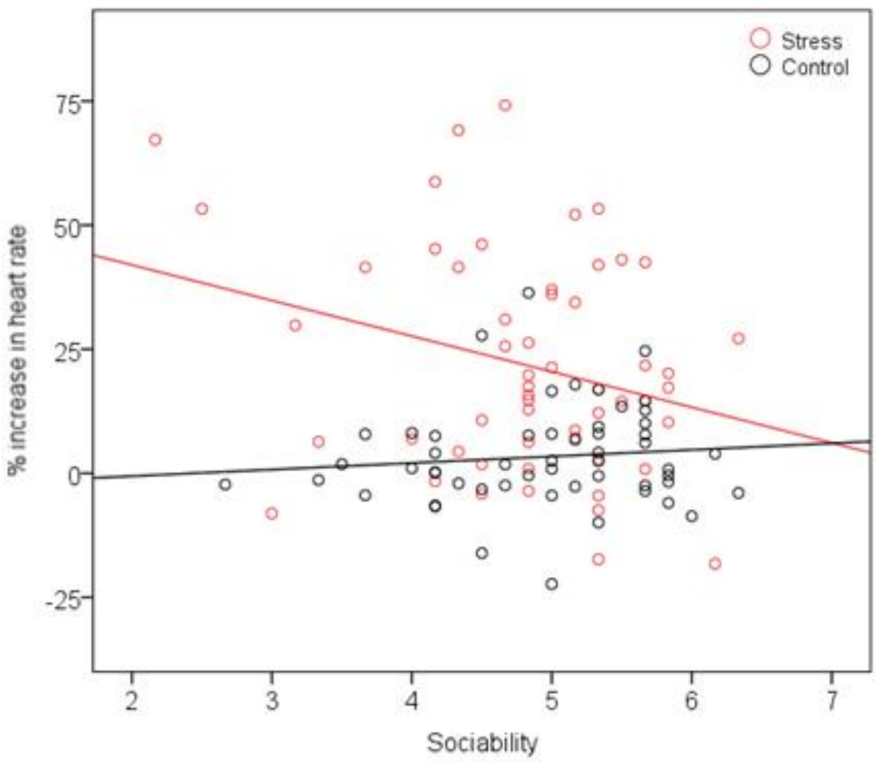
5.4.7.1 TEI and attentional bias: Reaction times

Hierarchical regressions were run to test whether TEI (either global or factor scores) would predict attentional bias (as determined through RT data) for different emotion types. Personality traits, cognitive ability, mental health were controlled for in the 2nd step, after experimental condition (step 1). The addition of global TEI, and TEI x condition terms did not significantly increase R^2 for the models predicting bias for sad faces, angry faces, or happy faces (sig(ΔFs) > .05) (**Table 18**). Furthermore, no predictors remained significant at the final steps. However, a different pattern of findings emerged when exploratory analyses were run with TEI subfactors (**Table 19**). For **sad** faces, entering the TEI subfactors significantly improved the model, ΔR^2 = .36, F(4, 44) = 2.02, p = .021, adjusted R^2 = .21. The addition of the TEI factor x condition terms did not improve R^2 further. Of the four factor scores, self-

Figure 13

TEI Sociability as a Predictor of Psychological and Physiological Reactivity, as a Function of Experimental Group





Note. NA = negative affect; HR = heart rate; TEI = trait emotional intelligence.

control was the only significant predictor of sadness bias, whereby higher scores predicted a bias *away* from sad faces across both conditions (β = -.56, p = .003). Entering factor scores and their interaction terms failed to predict bias for **angry** faces (sig(ΔFs) > .05). For **happy faces**, subfactors and their conditional effects failed to significantly predict bias (sig(ΔFs) > .05). Nevertheless, the emotionality, (β = 1.21, p = .07) and emotionality x condition terms (β = - 1.32 p = .057) approached significance for predicting bias for happy faces in the final model. However, even after removing the other subfactors from the model, the emotionality terms still did not significantly increase R^2 (sig(ΔFs) > .05). Furthermore, simple slopes analysis suggested that the relationship between trait emotionality and bias for happy faces was not significant for either condition (ps > .50). In sum, while global TEI did not predict bias for any emotion type, the self-control factor predicted a general bias *away* from sad faces.

5.4.7.3 AEI and attentional bias: Reaction times

After controlling for experimental condition (step 1) and covariates (step 2), AEI (EM) and AEI (EM) x condition terms failed to predict bias for sad faces, angry faces, or happy faces (sig(ΔFs) > .05). Similarly, AEI (EP) and AEI (EP) x condition did not predict bias for any emotion type once confounding influences had been controlled for (sig(ΔFs) > .05).

Table 18

Summary Statistics for Regressions of Bias (RT) for Different Emotions onto Condition, Personality, Cognitive Ability, Mental Health, and Global TEI Predictors

	Step 1: Condition		Step 2: FFM, cognitive ability, mental health			Step 3: TEI			Step 4: TEI x condition			Significant EI and covariate predictors (at Step 4)
Criterion	R^2	$F(1,58)$	R^2	ΔR^2	$\Delta F(9,49)$	R^2	ΔR^2	$\Delta F(1,48)$	R^2	ΔR^2	$\Delta F(1,47)$	
ANG	.00	.13	.21	.21	1.31	.22	.01	1.22	.22	.00	1.11	None
SAD	.07	**4.05***	.18	.11	1.07	.22	.04	1.25	.22	.00	1.13	None
HAP	.02	1.13	.17	.15	.97	.17	.00	.86	.18	.01	.84	None

Table 19

Summary Statistics for Regressions of Bias (RT) for Different Emotions onto Condition, Personality, Cognitive Ability, Mental Health, and TEI Subfactor Predictors

	Step 1: Condition		Step 2: FFM, cognitive ability, mental health			Step 3: Emotionality, Self-Control, Sociability, Well-being			Step 4: Subfactor x condition interactions			Significant EI and covariate predictors (at Step 4)
Criterion	R^2	$F(1,58)$	R^2	ΔR^2	$\Delta F(10,48)$	R^2	ΔR^2	$\Delta F(4,44)$	R^2	ΔR^2	$\Delta F(4,40)$	
ANG	.00	.13	.21	.21	1.31	.27	.06	1.20	.36	.09	1.26	A (β = 1.52*)
SAD	.07	**4.05***	.18	.11	1.07	.36	.18	**1.77***	.37	.01	**1.36***	SEL (β =- .56**)
HAP	.00	.08	.26	.26	1.47	.30	.04	1.23	.42	.12	1.42	N (β = -.57*)

Notes. ANG = bias for angry faces; SAD = bias for sad faces; HAP = bias for happy faces; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; SEL = Trait emotional intelligence (self-control factor); N = neuroticism. * = p < .05, ** = p < .01.

5.4.8 EI and attentional bias: Eye movement data

5.4.8.1 TEI and attentional bias: Eye movements

Hierarchical regressions were run to test whether TEI (either global or factor scores) would predict attentional bias (as determined through first fixations) for different emotion types. Personality traits, cognitive ability, mental health were controlled for in the 2nd step, after experimental condition (step 1). For models predicting bias for happy, sad, or angry faces, neither global TEI, nor TEI x condition terms significantly increase the models' R^2 (sig(Δ*F*s) > .05) (see **Appendix N** for regression tables). Furthermore, no predictors remained significant at the final steps, with the exception of predicting bias for sad faces, where conscientiousness (β = .38, *p* = .007), and subjective age (β = .46, *p* = .001), predicted bias *towards* sad faces, and anxiety predicted bias *away* from sad faces (β = -.12 *p* = .044), across both conditions. However, a potential role for the sociability TEI subfactor became apparent from exploratory analyses with TEIQue-ASF subscales. While the addition of the four subfactors did not explain any additional variance with respect to happy faces, sad faces, or angry faces (sig(Δ*F*s) > .05), sociability (β = 1.27, *p* = .021), and the sociability x condition term (β = -1.39, *p* = .012) remained significant predictors at the final step of the sad face predictor model. To probe further, the regression was rerun without the other three non-significant subfactors. Whereas the addition of sociability still did not significantly improve the model (sig(Δ*F*) = 32*)*, the subsequent addition of the sociability x condition term significantly increased R^2 (ΔR^2 = .11, *F*(1, 42) = 3.24, *p* = .003, adjusted R^2 = .52). However, further analyses of the regression slopes revealed that the relationship between trait emotionality and bias for sad faces was not significant for either the stress or control condition (*p*s > .05). In sum, TEI did not predict bias for any emotion type. While the hierarchical regression indicated that the sociability TEI subfactor predicted a general bias *towards* sad faces, significance of the finding did not withstand follow-up testing.

5.4.8.2 AEI and attentional bias: Eye movements

AEI (EM) and its subsequent conditional effects did not improve prediction of bias for happy sad, or angry faces (see **Appendix N** for regression tables). Likewise, entering AEI (EP) and its product vectors did not indicate a bias for sad or angry faces. However, while the addition AEI (EP) also did not improve the model for happy faces (ΔR^2 = .04, *p* = .149), the *interaction* between AEI (EP) and condition did (ΔR^2 = .09, p = .017). Follow-up testing suggested that in stressful conditions, higher AEI (EP) predicted bias for happy faces, with effects non-significant in the control group. However, despite that finding demonstrating that AEI (EP) presents an incremental contribution towards attentional processing of happy faces (i.e., it statistically *improved* the model), the final model was not statistically significant, *F*(1, 46) = 1.49, *p* = .143, adjusted R^2 = .16). Overall, while findings hinted at a potential role of AEI (EP) in facilitating first fixations happy faces in stressful conditions, neither EM nor EP robustly predicted first fixations, for any emotion type.

H3: EI will predict less post-event rumination after a stressful task

5.4.9 EI and post-event rumination

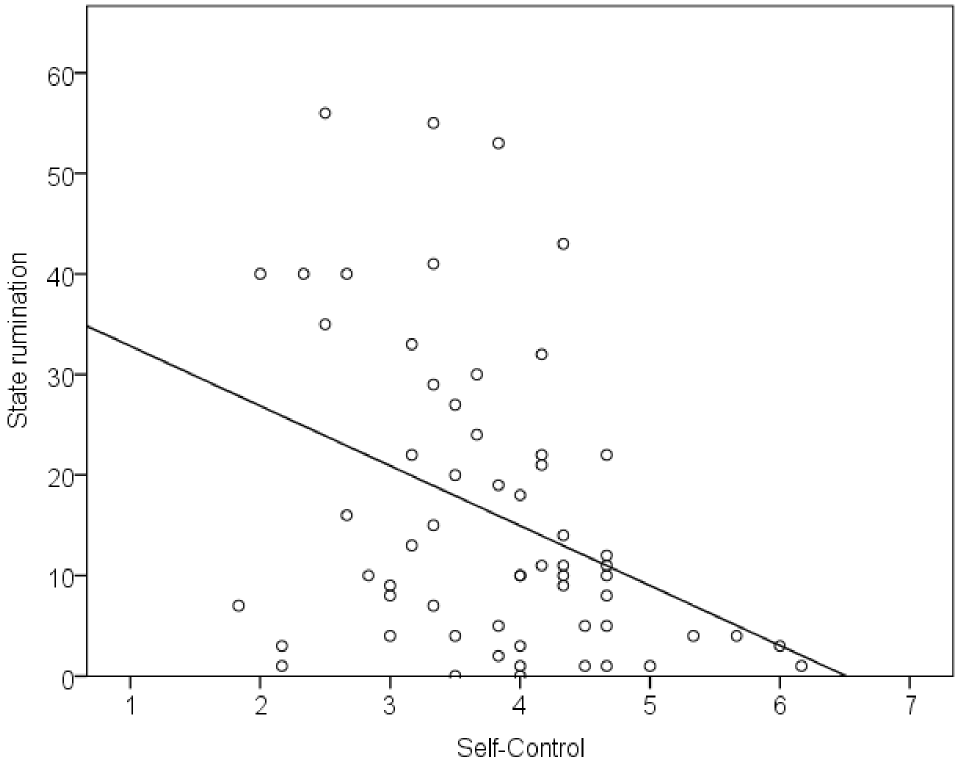
In general, participants ruminated more after the stressful task (singing: *M* = 23.81, *SD* = 15.18) than the control task (reading: *M* = 8.03, *SD* = 9.87), *t*(1,58) = 4.80, *p* < .001). In the stress condition, negative relationships were identified between rumination and global TEI (*r* = -.48, *p* = .006), a finding which also applied to the self-control (*r* = -.44, *p* = .013) and well-being subfactors (*r* = -.47, *p* = .007). Unexpectedly, TEI was also negatively correlated with rumination after the control (i.e., *non-stressful*) task, in the case of global scores (r = -.48, p = .009), and the emotionality and well-being subfactors (r = -.43, p = .019; r = -.50, p = .006). AEI (EM) was also negatively related to rumination in the control condition (r = -.50, p = .006). Whilst the above significant *correlations* were present, hierarchical regressions were run to test whether EI (or EI x condition effects) improved the prediction of post-stressor rumination after covariates had been accounted for.

5.4.9.1 TEI and post-event rumination

For all models, experimental condition (step 1) predicted rumination, as described above. Entering the covariates for step 2 significantly improved the rumination model (ΔR^2 = .24, F(10, 48) = 4.70, p = .022 adjusted R^2 = .41), but the inclusion of TEI (ΔR^2 = .01, p = .332) and its interaction terms (ΔR^2 = .00, p = .530) at steps 3 and 4 did not. No predictors were significant at the final step (ps >.05). Similarly, when all four TEI factors (ΔR^2 = .01, p = .861) and their interaction terms (ΔR^2 = .05 p = .301) were added to the model, the R^2 did not significantly increase. However, at the final step of that model, self-control (β = -1.14, p = .049) remained a significant predictor of rumination. To test the possibility that self-control effects were being masked by the presence of other non-significant predictors, the regression was re-run without the non-significant predictors. Indeed, the addition of self-control to the model then improved R^2 (ΔR^2 = .09, F(1, 57) = 16.69, p = .006, adjusted R^2 = .35), whereas the addition of self-control x condition still did not (p > .05). Thus, scoring more highly on the self-control factor predicted less state rumination, regardless of whether the task was stressful or not (β = -.97, p = .017) (**Figure 14**).

Figure 14

Self-Control as a Predictor of Post-Event Rumination (Absolute Values)



5.4.9.2 AEI and post-event rumination

AEI (EM) and its subsequent conditional effects did not improve prediction of rumination (ΔR^2 = .03, *p* = .129, conditional effects ΔR^2 = .01, *p* = .300). AEI (EP) also failed to produce a significant increase in R^2 (ΔR^2 = .02, *p* = .231; conditional effects ΔR^2 = .00, *p* = .583).

5.5 Discussion of key findings

The present study explored whether EI moderated early attentional processing of emotion under conditions of psychosocial stress, and is the first to do so with an adolescent population. In addition, the study served to replicate Study 1, by testing whether EI related to stress reactivity (where the individual directly modulates the stress response once an emotion has been elicited; Gross, 1998a), using pooled data from Studies 1 and 2 (**H1**). In terms of response modulation, analyses of the pooled sample revealed that TEI predicted *both* psychological and physiological stress reactivity, with sociability playing an important role. As with Study 1, AEI was not a significant predictor of stress reactivity. A confusing picture emerged with respect to attentional processing, which did not provide support for **H2**. Significant findings only present for the TEI self-control subscale. Higher scores predicted a tendency to orient away from sad faces (for RT data only), a pattern which operated irrespective of the context (i.e., this bias was found in both stress *and* control conditions). That same subscale also predicted less post-event rumination, likewise across both experimental conditions (partially supporting **H3**). Importantly, EI predicted all of the outcomes described above beyond the effects of broadband personality dimensions, cognitive ability, and mental health, suggesting EI may offer unique contributions to both automatic and conscious ER processes in adolescents.

5.5.1 EI and reactivity to acute psychosocial stress

Amidst the concerns of a potential replication 'crisis' in psychology, it is important to ensure findings replicate, using the same methods but a different set of participants (Makel, Plucker, & Hegarty, 2012; Nelson, Simmons, & Simonsohn, 2017). The present study replicated the stress induction paradigm from Study 1, yielding similar results. Because the TEIQue sociability subscale predicted stress reactivity in two independent samples, we can be more confident about the importance of perceived social competence in the context of psychosocial stress for young people, and the generalisability of the finding. Interestingly, when analyses were conducted with the larger, pooled sample (n = 118), sociability predicted both psychological reactivity *and* physiological reactivity, indicating that sociability may contribute to multiple aspects of the fight or flight response in social settings. Advice that strongly recommends the inclusion of both subjective and objective stress measures in reactivity studies (Andrews et al., 2013; Campbell & Ehlert, 2012) is rarely adhered to in the EI field (Lea et al., 2019). However, because our finding applies to both objective (i.e., HR) and subjective (i.e., mood) measures, there is little risk of shared measurement error (methodological "contamination") between TEI (i.e., *self-reported* EI) and psychological reactivity (i.e., *self-reported* stress) (Keefer et al., 2018). It is still noteworthy that EI did not relate to EDA reactivity, but this is likely due to the different temporal trajectory observed with EDA, relative to HR (Nikolic-Popovic & Goubran, 2011).

Clues for the mechanisms that underlie sociability's buffering effect can be gained by scrutinising its nomological network. Discussion in Chapter 4 indicated that TEI sociability is a conglomerate of several constructs, including assertiveness, social competence, agreeableness, and self-efficacy (Petrides, 2009). Evidence that has examined the role of those constructs in relation to ER could therefore help explain why sociability conferred adaptative stress responding in a social context. For example, experimental evidence suggests that agreeable individuals might possess an ability to diffuse negative social cues (e.g., judgement from others) in stressful social environments, by focussing on prosocial thoughts (Meier et al., 2006). Crucially, however, Big Five personality traits (including agreeableness) were controlled for. Assertiveness in social settings could be the key distinguishing aspect of sociability that explains stress reactivity beyond agreeableness (p.128). Assertive individuals are self-efficacious, and have high self-esteem, meaning they can face stressful demands with confidence (Murphey et al., 2013). Evidence suggests that not only do assertiveness, self-esteem, and self-efficacy, help buffer the effects of stress reactivity (Hughes, 2007; Krieger, Hermann, Zimmermann, & Holtforth, 2015), but that higher levels are associated with perceiving threats as challenges rather than threats (e.g., Trotman, Williams, Quinton, & van Zanten, 2018). Perhaps, high sociability individuals perceive socially charged acute stressors as less threatening, and their prosocial nature and self-efficacy enables them to instead focus on managing their emotional response (Meier et al., 2006; Mikolajczak et al., 2008). Self-efficacious individuals also tend to show an internal locus of control (a known protective factor in stressful situations) meaning that they attribute situation outcomes to their own efforts and abilities (Roddenberry & Renk, 2010). Taken together, perhaps in times of psychosocial stress, individuals with higher levels of sociability draw on several adaptive traits (e.g., the agreeableness aspect ‘activates’ prosocial thoughts; self-efficacy ‘activates’ appraisals which label the threat as a challenge, and within the individual’s control) to ultimately, act on the autonomic nervous system (ANS) to present a less extreme response. However, such mechanisms are speculative and were not tested directly in the present study.

As with Study 1, AEI did not contribute significantly to stress reactivity, corroborating the notion that how confident adolescents feel about their emotional abilities matters more for stress response modulation than their actual emotion-cognitive skill. In addition, the failure of the present study sample (and the pooled sample) to identify a significant role of self-control with relation to stress reactivity, suggests that the initial self-control finding was potentially a false positive.

5.5.2 EI and attentional deployment

To recap, attentional allocation, the process of selectively concentrating on some stimulus, is an important ER process that has the potential to buffer acute stress (Gross, 1998a; Todd et al., 2012). There are certain ways of processing emotional material in our environment that are more adaptive than others, with these patterns dependent on the situation. The prevailing theoretical model proposes that whether an individual should allocate more attention to negative or positive emotional material in our external environment is dependent on the level of threat present (Mogg & Bradley, 1998). Ultimately, adaptive processing entails avoidance of threat (i.e., attentional bias *away* from threat) in non-stressful conditions, but hypervigilance for threat (i.e., attentional bias *towards* threat) in acutely stressful conditions (Yiend, 2009). Theoretically, patterns of visual processing of high EI scorers *should* align more closely with the adaptive profile than low scorers (Davis, 2018b), and this formed the basis of **H2**. To test this, attentional bias for happy, sad, and angry faces was operationalised using RT and eye movement data obtained from a dot probe task, following a stress induction.

There were no significant effects of global TEI, AEI (emotion management; emotion perception), on attentional selection. However, performing exploratory TEI subscale analyses provided more meaningful interpretations (Downey et al., 2010; Zeidner, Matthews, & Roberts, 2012). The exploratory analyses in the present study revealed that the self-control TEI subscale predicted a bias away from sad faces, a finding consistent across both stressful and control conditions. Because of its specific role in the present study, the rest of the discussion will focus on the TEI self-control factor. According to TEIQue developers, the self-control factor represents a perceived ability to control impulses and cope under pressure (Petrides, 2009), with high scorers perceived themselves as “capable of controlling their emotions”, “reflective and less likely to give in to their urges”, and “capable of withstanding pressure and regulating stress”. For context, these traits are derived from the following items from the TEIQue-ASF (Petrides, 2009):

- I find it hard to control my feelings (Item 4, reverse-scored)
- I change my mind often (Item 7, reverse-scored)
- I'm able to deal with stress (Item 15)
- I can control my anger when I want to (Item 19)
- Sometimes, I get involved in things I later wish I could get out of (Item 22, reverse-scored)
- I try to control my thoughts and not worry too much about things (Item 30)

Thus, self-control is the part of TEI that specifically targets perceived abilities regarding emotion regulation and stress management. Previous research has demonstrated that perceived emotion regulation abilities are associated with the implementation of more efficient ER strategies in times of stress, such as more adaptative coping styles, and more 'challenge' versus 'threat' cognitive appraisals of stressors (Mikolajczak et al., 2006; Salovey et al., 2002). It would therefore make sense for people scoring highly in perceived self-control to show higher resistance to stress, by preferentially attending to threat under stress (Bar-Haim et al., 2007; Mogg & Bradley, 1998; Yiend, 2009). One study also found a role for self-control in attentional processing, where self-control produced context-sensitive effects on attentional bias in adults (Mikolajczak et al., 2009b). Higher scores predicted an attentional bias for emotional material (regardless of valence) in stressful conditions, and attentional bias for neutral material in neutral conditions. However, several of the methodological shortcomings in that study were addressed in the current study, potentially accounting for the differences in the findings. For example, Mikolajczak et al. (2009) measured responses to arbitrary symbols rather than biological salient stimuli (i.e., emotional faces), and categorised stimuli as either 'neutral' or 'emotional', without distinguishing between discrete emotions. However, Davis (2018b), upon which the methodology of the present study was based, only identified roles for emotionality, well-being, and sociability TEI subscales in the initial orienting of adults' attention. Perhaps the self-control subscale plays a unique role in the attentional processing of stimuli with adolescents, specifically with relation to sadness-inducing stimuli.

Emotionally negative stimuli may warn of dangers to be avoided. However, while angry faces were the primary focus (as anger is the most threatening emotion used in the study), it is surprising that a significant outcome was only detected for sad faces, since sadness-inducing stimuli do not represent threat *per se*. Attentional biases *towards* sadness are typically seen in young people with either clinical depression, or depression symptomology (for meta-analysis see Peckham, McHugh, & Otto, 2010), though there are exceptions (e.g., Sylvester, Hudziak, Gaffrey, Barch, & Luby, 2016). In fact, a tendency to preferentially attend to and process sad stimuli appears to be a depression-state marker in adolescents (Maalouf, Clark, Tavitian, Sahakian, Brent, & Phillips, 2012). Although such research usually uncovers depression-sensitive patterns relate to a failure to disengage from sad stimuli, rather than an orienting (i.e., avoiding) preference (Teachman, Joorman, Steinman, & Gotlib, 2012), evidence generally suggests that avoiding sadness-evoking stimuli is adaptive in everyday circumstances (Mennen, Norman, & Turk-Browne, 2019), suggesting that self-control helped facilitate adaptive attentional processing in our study. It is important to note that mental ill health was included as a covariate in the present study (using the HADS). In other words, biases for and away from sad stimuli in the present study could not be attributed to depressive symptomology, meaning that TEI self-control predicted avoidance of sad stimuli over and above clinical factors.

Findings suggest that a perceived ability to regulate one's impulses and emotions (i.e., self-control) could be protective in relation to *depressive* symptomology, rather than buffering stress. Indeed, in the present study, self-control correlated negatively with the depression scale of the HADS (r = .41, p < .001) (**Table 15**). Since not all studies perform subscale-level analyses, it becomes necessary to draw upon the broader EI literature to try and explain the finding that self-control corresponded with sadness avoidance. A wealth of cross-sectional, questionnaire-based studies have identified an association between higher TEI and lower risk of depression in adolescents (e.g., Balluerka, Aritzeta, Gorostiaga, Gartzia, & Soroa, 2013; Fernández-Berrocal et al., 2006; Foster, Lomas, Downey, & Stough, 2018). Although such studies did not always use the TEIQue, significant findings often specifically related to subscales relating to emotion management, akin to the self-control subscale of the TEIQue (e.g., the *repair* scale of the TMMS; Balluerka et al., 2013; the *emotion management and control* subscale of the adolescent SUIT; Foster et al., 2018). Those findings suggest that self-control associated with a lower risk of depression, supported by the current study, which suggests this may be due to a tendency to avoid sad stimuli. Because clinical symptoms were controlled for in the present study, the result could perhaps indicate a way in which EI could safeguard against depression in the future.

As with Study 1, no significant findings were yielded with respect to AEI, again emphasising the distinctiveness of the TEI and AEI constructs (Petrides, 2011). How well adolescents feel they can control their emotions and impulses appears a more important facilitator of attentional processing than their actual emotion-cognitive skill. However, it is important to note that effects found for EI and early attentional processing of sadness were not context-specific, as experimental condition was not a significant moderator. This is quite a puzzling finding. Given the highly successful stress manipulation check in both Study 1 and the present study (effect sizes of $n^2_{partial}$ were large in every case [Cohen, 1988]), it seems unlikely that stress-dependent effects were not achieved due to issues of stressor effectiveness. Participants in the stress condition showed a significantly larger increase in psychological and physiological stress indices than those in the control condition. An alternative explanation could be that while the stressor was powerful in inducing short-term stress, the effects subsided over the course of the 12-minute dot probe task (i.e., the participants became less stressed as time went on). To test that possibility, additional analyses were conducted separately for the first half of the dot-probe task (i.e., the first 6 minutes) and the second half (i.e., the latter 6 minutes) (data not shown). For example, the RT bias for sad faces in the 1st half was calculated by subtracting the average RT for congruent anger trials from the average RT for incongruent anger trials, for the first 16 anger-neutral trials only. These values were then regressed onto EI using the same analyses outlined in the results section. If stressor potency influenced the outcomes, we would expect that findings would differ between the two halves. However, the findings achieved for the first and second halves were identical to those reported in the results: TEI self-control predicted a bias away from sad faces (as indicated by RT data), but tests for global TEI, other TEI subscales, and AEI (management and perception), failed to produce significant findings.

A potential explanation for the seemingly generalised effect of self-control could be that attentional selection was not adequately captured by the dot-probe paradigm used in the present study. Indeed, the fact that significance was only identified for the RT measure of attention (i.e., keypress), and not first fixation (i.e., eye movements), suggest that the data may not have sufficiently captured early vigilance. The present study captured early attentional selection by identifying the emotion of first fixation (between 100ms and 500ms after stimulus presentation), in line with similar work (Davis, 2018b), However, early attentional selection is thought to involve a *combination* of processes (vigilance, disengagement, avoidance) (Bar-Haim et al., 2007; Cisler & Koster, 2010), with the latter two components typically underrepresented in attention research (Cisler & Koster, 2010), and which relate to other theories of anxiety and attentional processing. One hypothesis: the theory of attentional maintenance (AM; Fox, Russo, Bowles, & Dutton, 2001) suggests that that anxious individuals are not more vigilant for threatening stimuli, but that once attended, they find it difficult to disengage from it. As the present study focussed only on first fixations (i.e., vigilance for threat), it is not possible to test whether EI facilitates adaptive responding with respect to other attentional patterns. Nonetheless, the present study takes an important step by replicating work exploring EI and threat vigilance in adults (Davis, 2018b) with an adolescent sample, using a similarly robust methodology (i.e., by using RTs and eye-tracking, both 'types' of EI, and controlling for confounding influences). Future researchers should investigate EI and the more elaborative attentional processes (i.e., disengagement, avoidance) by measuring dwell time on stimuli, or fixations after 500ms (Georgiou, Bleakley, Hayward, Russo, Dutton, Eltiti, & Fox, 2005; Schofield, Johnson, Inhoff, & Coles, 2011). To address these concerns, future research could investigate EI and attentional bias using alternative paradigms, such as visual search tasks (van Bockstaele, Lamens, Salemink, Wiers, Bögels, & Nikolau, 2020).

5.5.3 EI and post-event rumination

As a maladaptive ER strategy, ruminating (which features intrusive, repetitive, unwanted thoughts that interrupt ongoing activities; Rachman, 1981) can lead to internalising disorders in adolescents (for meta-analysis, see Rood et al., 2009; Young & Dietrich, 2015). The present study is the first to assess the relationship between EI and post-stressor rumination in adolescents. While others have explored whether EI relates to *trait* rumination (i.e., a general tendency to ruminate), there is a dearth of evidence concerning *state* rumination (i.e., rumination in direct relation to a recent, specific stressful experience), which has important consequences for adaptation. The third hypothesis of the present study predicted that both TEI and AEI should predict less rumination after the stressful (singing) task. However, while global TEI and AEI failed to predict rumination, only the self-control TEI subscale predicted less post-event rumination across both stressful and control conditions. In other words, when individuals had greater self-perceived tendency to control their emotions and impulses (Petrides, 2009) they had fewer negative thoughts after completing a task (whether the task was stressful or not).

The finding that self-control scores corresponded with less post-event rumination is corroborated by the literature for adult samples. For example, global TEI predicts fewer intrusive thoughts following an experimental stressors (Ramos et al., 2007; Salovey et al., 1995). The finding of the present study could be explained by evidence suggesting that higher TEI predicts a general tendency to 'savour' positive emotions, and to distract oneself from negative emotions (Gómez-Baya & Mendoza, 2018; Salovey et al., 2002; Szczygieł & Mikolajczak, 2017). Adolescents who felt that they could control their emotions may have been able to exert more control over their negative conscious thought processes, shifting focus to more positive thoughts. It is unclear why the moderation effect on rumination was generalised (i.e., to both the stressful *and* control task), but the finding nevertheless indicates an adaptive role for self-control subscale. Even though reading a magazine article is less stressful than singing a song, both tasks were performed in the presence of a stranger. By ruminating less about performances in socially evaluative situations, a perceived ability to manage emotion could have a protective effect for young people (i.e., by reducing the extent to which they dwell on everyday stressors).

5.5.4 Implications for EI as a protective marker in adolescence

Significant findings were restricted to aspects of perceived emotional competence (i.e., TEI), and not actual emotional competence (i.e., AEI). First and foremost, findings replicated those of Study 1, supporting the tentative conclusions made in the discussion of Chapter 4: how confident adolescents feel about their emotional competence (captured via the TEI sociability subscale) appears to confer adaptivity, by dampening the fight or flight response in the context of acute stress. Study 2 extended that investigation into the workings of EI by measuring both automatic (i.e., bias for emotion) and controlled (e.g., post-event rumination) attentional selection processes under stress (Gross, 1998a). With respect to automatic attentional processing, a perceived ability to control impulsivities and emotions, as captured via the self-control subscale of the TEIQue, corresponded with a generalised avoidance of sad faces. Because evidence suggests that adolescent depression is often characterised by an attentional bias for sad emotion (Peckham et al., 2010), avoidance of sad emotion is generally thought to confer adaptation in neutral conditions. Similarly, self-control predicted a lesser tendency to ruminate in relation to a recently completed task (i.e., experimental: singing a song, or control: reading a magazine article). Evidence consistently demonstrates that adolescents who ruminate less tend to fare better in terms of anxiety and depression outcomes (Rood et al., 2009; Young & Dietrich, 2015). Thus, these findings would seem that perceived self-control *could* facilitate resilience in young people. However, it is challenging to determine whether the findings relating to attentional processing were adaptive, because effects applied across both stressful and non-stressful contexts. Conclusions should remain tentative until similar findings are demonstrated with other studies using adolescent samples. Furthermore, as with Study 1, the same caveat applies: findings may only be applicable to the specific paradigm used (i.e., psychosocial stresss), since the specific emotions and physiological outcomes that emerge in a challenging situation are highly idiosyncratic (Denson et al., 2009). Even though effects were not contingent on the stressor condition, this does not mean that a different pattern of findings would not apply to different types of stressors.

5.5. 5 Limitations

The findings of the present study should only be considered in light of its limitations, the first of which refers to measurement issues. While most measures proved reliable in the present study (e.g., crystallised intelligence [vocabulary test], Big Five traits [mini-IPIP], AEI [STEM-B], mental health [HADS], mood [PANAS]), yielding similar Cronbach's α values to Study 1, some of the TEIQue-ASF subscale scores were questionable. Reliability scores were comparable to those in Study 1 for the TEIQue global score (.88), well-being (.76), and emotionality (.68), but were lower for the self-control (.53) and sociability scales (.51). It is concerning that it is those latter two subscales for which significant findings emerged in the present study. However, these scales do sometimes generate relatively low estimates of internal consistency, especially when the short form of the TEIQue is used (e.g., Davis, 2018b). The low reliability of the subscales could be attributable, at least in part, to the use of the short form of the TEIQue measure (30 items), rather than the longer form (153 items), a decision made for pragmatic purposes. Thus, drawing firm conclusions regarding the role of the component subscales of TEI should be reserved until similar findings are observed when the full-length version of the scale is used (TEIQue-AFF; Petrides, 2009). This issue is discussed further in the general discussion (Chapter 7).

The second limitation relates to the study sample. Due to difficulties recruiting participants within the specified age group, a convenience sample of students (aged 16-18 years) from a local university was also recruited. Consequently, the final sample consisted of a small number of first-year undergraduate students (n =10) in addition to Sixth Form students (n = 51). Despite participants being in the same 16-18 age bracket, there was a risk that Sixth Form students could have differed in terms of their emotional mind-sets and maturity from those who have recently started university (e.g., Fang & Galambos, 2014). Participants' subjective age (i.e., perceived maturity) was requested, to try to account for potential differences attributable to that phenomenon. Subjective age, EI, or scores on any of the covariates (e.g., Big Five personality traits) did not differ between Sixth Form students and university students (p > .05) (data not shown). However, while the risk of major psychological differences between the two participant subsets seems small, it still remains possible, that other differences in those 10 students that were not captured could have influenced study findings.

Third, there are drawbacks with the attention paradigm selected. As described in the introduction, 'adaptive' processing theoretically embodies avoidance of threat (i.e., attentional bias away from threat) in non-stressful conditions, but hypervigilance for threat (i.e., attentional bias towards threat) in acutely stressful conditions (Yiend, 2009). That attentional selection pattern reflects the evidence that individuals with high anxiety show a generalised vigilance for threat (Mogg & Bradley, 1998). Early attentional selection was operationalised in the present study as the emotion of first fixation (Davis, 2018b). However, as noted earlier in the discussion, attentional selection is thought to involve a combination of processes (vigilance, disengagement, avoidance) (Bar-Haim et al., 2007; Cisler & Koster, 2010). For example, the AM theory (Fox et al., Dutton, 2001) suggests that that anxious individuals are *not* hypervigilant for threat, but that they struggle with disengagement. In addition, the dot probe itself is sometimes criticised for yielding potentially unreliable estimates of individual differences in attentional bias (Chapman, Devue, & Grimshaw, 2019; Schmukle, 2005). Future research should investigate EI and other aspects of attentional selection (i.e., disengagement, avoidance) by measuring dwell time on stimuli, or fixations after 500ms (Georgiou et al., 2005; Schofield et al., 2011), using alternative paradigms, such as visual search tasks (van Bockstaele et al., 2020).

Finally, the ecological validity of the present study (and indeed, Study 1) needs to be acknowledged. While the experimental paradigm offers the several advantages (e.g., an opportunity to control confounding influences), participants may behave quite differently when exposed to more naturalistic stressors, or in response to more salient emotive stimuli. For example, studies have found that the Trier Social Stress Test does not have as pronounced an effect as a real-life stressor (e.g., examination; Henze et al., 2017). It is essential to verify if and how EI contributes to stress regulation processes in more applied settings (e.g., social media stress), which is precisely what the proceeding study intends to explore.

In conclusion, findings indicated key roles for the sociability and self-control domains of TEI, but not AEI, for adolescents experiencing acute psychosocial stress. Akin to Study 1, sociability buffered the effects of both psychological and physiological stress. A dot-probe task was then used to determine whether EI influenced the emotion that adolescents first fixated to following stimuli presentation. The only significant predictor of attentional selection was the self-control subscale, which corresponded with avoidance of sad emotion. However, because the effect was not contingent on experimental condition (i.e., neutral; stressful), we cannot infer whether self-control underscores 'adaptive' attentional processing. In all analyses, neither strategic nor experiential AEI predicted any aspect of stress regulation, suggesting that for adolescents, how confident they feel in their emotional abilities seems more predictive of stress outcomes in social settings than their actual emotional skill. However, it could be that TEI and AEI buffer stress differently depending on the situation, and methodology used. While Studies 1 and 2 have demonstrated a potential role for *TEI* in a controlled stress paradigm, it is essential that EI and stress regulation processes are also explored using more salient, naturalistic stimuli. Study 3 will assess how adolescents respond when exposed to ecologically valid material stimuli, using material that closely resembles distressing social media posts.

CHAPTER SIX

EMOTIONAL INTELLIGENCE AND EMOTION REGULATION IN RESPONSE TO EMOTIVE SOCIAL MEDIA POSTS

6.1 Chapter overview

Whereas Studies 1 and 2 used an experimental approach to explore how EI moderates stress regulation processes, it is not clear whether findings generalise to everyday situations. This chapter presents the findings of Study 3, a novel study that investigates how EI may moderate emotion regulation (ER) in a more applied context: social media. Social media presents a pertinent new stressor in adolescence (O'Reilly et al., 2018), with which there are particular concerns that the heightened emotional sensitivity and protracted development of cognitive control in adolescents make them specifically reactive to emotion-arousing material online (Crone & Konijn, 2018). EI could help safeguard adolescent well-being by facilitating 'healthy' ER on social media upon exposure to emotive posts. Upon viewing an ecologically valid artificial newsfeed, 189 participants reported how each post made them feel (affective response), how drawn they were to that particular post (attentional preference), and their likelihood of engaging with that post (situation selection). Findings indicated that only *ability* EI (AEI) appeared important in amplifying affective responses towards stimuli. Furthermore, mediation analyses demonstrated one way through which AEI could lead to positive well-being outcomes in young people is via a tendency to present stronger affective reactions to material on social media. It would appear that in applied settings, actual emotional skill (i.e., AEI) is more pertinent to ER than perceived emotional skill (i.e., TEI), in contrast to the findings from the experimental studies.

6.2 Introduction

Several EI researchers have emphasised the importance of stress context when trying to understand the mechanisms underlying EI (e.g., Davis, 2018b; Fiori, 2015; Mikolajczak et al., 2008). The previous two studies used an experimental paradigm, conducted in controlled settings. Findings from those studies suggested that TEI may influence the ER processes of response modulation and attentional allocation (Gross, 1998b), at least in the context of acute psychosocial stress. Specifically, findings highlighted contributions of sociability (i.e., perceived assertiveness, social competence), and self-control (i.e., perceived ability to control emotions and impulses) subscales. The studies used validated, robust methodology (e.g., an established stress induction procedure [Sing-a-Song Stress Test, SSST; Brouwer & Högervorst, 2014]; a validated dot-probe paradigm [Davis, 2018]), while addressing notable limitations identified from previous studies. For example, research was conducted with a neglected sample (i.e., 16-18-year olds), controlled for confounding influences, and measured multiple aspects of EI to maximise explanatory power (i.e., TEI, emotion management, emotion perception, emotion understanding [though the latter measure was deemed unreliable]). However, the experimental paradigms only assessed the contribution of EI to ER processes under *controlled* conditions. EI may operate quite differently when stimuli are more ecologically valid, and salient to the developmental stage. For example, responses to static emotional faces on a plain background (i.e., the material used in the dot-probe task; Tottenham et al., 2009) may not reflect how adolescents would respond to the emotive material adolescents they are exposed to on a daily basis, such as social media posts.

6.2.1 Social media as a stressor in adolescence

The proliferation of social media use over the last decade is widely acknowledged, with the amount of time young people spend online having doubled in the past decade (Ofcom, 2017). In Great Britain, 96% of 16-24 year olds now use social media (Office for National Statistics, 2017). Social media refers to interactive websites or online applications (“apps”) that allow users to generate and share content with others, create personalized profiles, and develop online social networks (Obar & Wildman 2015).

There is an ongoing, heated debate as to whether social media negatively impacts the social and emotional well-being of children and adolescents (Bell, Bishop, & Przybylski, 2015). The debate spans research, policy, and practice, relating to young people, and features a strong tendency to focus on screen-time (the amount of time spent using a device with a screen, such as a smartphone, computer, television, or video game console). Whilst there is a general consensus and empirical evidence to suggest that *problematic use* (i.e., excessive use) or *addiction* to social media is detrimental to an individual’s well-being (Kuss & Griffiths, 2017), there is intense scrutiny on whether everyday use (i.e., screen-time use that does not reach the psychopathological threshold) is still harmful. For example, many governmental organizations in the UK have called for more research into digital screen time (UK Science and Technology Committee [Commons], 2017). However, the many cross-sectional studies that have tested for associations between screen-time and adolescent well-being have produced conflicting findings. Evidence has suggested that adolescents who spend more time on social media show greater levels of anxiety and depression (Woods & Scott, 2016; Vannucci, Flannery, & Ohannessian, 2017), less life satisfaction (Booker, Skew, Kelly, & Sacker, 2015), and lower levels of happiness (Twenge, Martin, & Campbell, 2018). Yet, a high-quality pre-registered analysis of UK adolescents found that *moderate* digital engagement did not predict well-being, but very high levels of usage could be problematic (Fernandes, 2017; Przybylski & Weinstein, 2017). Furthermore, a recent rigorous large-scale analysis using three datasets (*n* = 355,358) examined correlational evidence for digital technology (including social media) and adolescent well-being (Orben & Przybylski, 2019). The association between digital technology use and adolescent well-being was negative, but very small, explaining a maximum of 0.4% of the variation in adolescent well-being. However, negative associations between social media use and well-being often receive a disproportionate amount of attention, in both the academic and public domains, even when correlations are small (Orben & Przybylski, 2019). As a result, social media is often blamed for the increase in adolescent mental health problems.

To make sense of the abundance of individual studies that have investigated social media and adolescent well-being, a multitude of meta-analyses and systematic have been conducted (e.g., Best, Manktelow, & Taylor, 2014; Marino et al., 2018; Orben & Przybylski, 2019; Uhls, Ellison, & Subrahmanyam, 2017; Verduyn et al., 2017; Zhan et al., 2016). However, findings are very mixed. Often, such reviews simply conclude that using social media has both benefits *and* risks. For example, social media can assist with identify formation (Eleuteri, Saladino, & Verrastro, 2017), and combatting loneliness, by providing social support (Matook, Cummings, & Bala, 2015), yet it is also associated with an increased levels of body dissatisfaction (Kleemans, Daalmans, Carbaat, & Anschutz, 2016), cyberbullying (Reid & Weigle, 2014), and somatic symptoms (e.g., sleep problems; Woods & Scott, 2016). Furthermore, different social media platforms appear to differentially predict psychosocial adjustment outcomes (Vannucci & Ohannessian, 2019). Whether or not the ‘net’ effect of social media is positive or negative, the fact remains that in late adolescence in particular, social media can present a pertinent, yet poorly understood, form of everyday stress that warrants further investigation (O’Reilly et al., 2018).

6.2.2 Individual differences on social media: The “rich-get-richer” hypothesis

The relationship between social media use (i.e., screen-time) and adolescent well-being is fundamentally complex, and likely to be dependent on the presence of a multitude of protective factors and risk factors. Ultimately, while attempting to explore the mechanisms through which social media impacts adolescents, researchers may be asking the ‘wrong’ questions. Instead of focussing on the effects of screen-time alone, it may be more pertinent to ask: “which factors mediate and moderate relations between social media and mental health outcomes?” (Uhls et al., 2017, p. 3). A new school of thought considers that the relationship between social media use and well-being may be dependent on how social media is utilised (i.e., which material is engaged with) (Seabrook et al., 2016), and individual differences (Vannuci & Ohannessian, 2019). Adolescent social media use may not be intrinsically harmful for adolescent well-being *per se*, but rather the specific ways in which some individuals use it could be (Weinstein, 2018).

The *rich-get-richer* hypothesis (or, social enhancement hypothesis), initially suggested by Kraut, Kiesler, Boneva, Cummings, Helgeson, and Crawford (2002), proposes that those who already have strong social skills and resources benefit the most from social media. There has generally been more support for that hypothesis over the competing *poor-get-richer* hypothesis (e.g., Abbas & Mesch, 2016; Liu & Brown, 2014; Wilson, Fornasier, & White, 2010). It could follow, then, that social media may produce psychological benefits for the least vulnerable, and harm those that are the most vulnerable (Seabrook et al., 2016). As with most forms of psychological maladjustment, there are individual factors that exacerbate or protect young people from the potentially negative effects of social media. Research into the identity of those factors, and how and when they contribute to the social media use-well-being trajectory, is dwarfed by the wealth of cross-sectional research on screen-time and life outcomes. Yet, preliminary evidence has highlighted some individual-level protective factors that may safeguard adolescent mental health and well-being on social media.

Whereas there is scant research on EI as a protective factor for the effects of social media, emotion-related constructs that appear in EI's nomological network have shown promise in this regard. Indeed, positive self-related constructs related to TEI are often identified as protective factors in the context of social media. For example, evidence often suggests a protective function of extraversion online. Consistent with the "rich get richer" model, social media use often predicts better subjective well-being (SWB) outcomes for more extraverted individuals, compared to more introverted individuals (Cheng, Wang, Sigerson, & Chau, 2019; Kraut et al., 2002; Zywica & Danowski, 2008). In contrast, higher levels of neuroticism, another Big Five personality trait, can magnify the detrimental association between Facebook addiction and well-being (e.g., Chow & Wan, 2017; Turel, Poppa, & Gil-Or, 2018). TEI often correlates strongly with those traits; positively with extraversion, but negatively with neuroticism (Petrides et al., 2007; Petrides, Vernon, Schermer, Ligthart, Boomsma, & Veselka, 2010). Evidence also suggests that individual dispositions, such as personality, can also predict individuals' motivations for using social media, which can consequently influence well-being outcomes (Seidman, 2013). Another self-positive trait – self-esteem, (the global sense of self-worth and adequacy as a person;

Rosenberg, 1965) also benefits well-being via a reduced tendency to make social comparisons on social media (Bergagna & Tartaglia, 2018; Zywica & Danowski, 2008). Thus, if the above TEI-related factors provide protective benefits in the context of social media, it suggests that TEI could also have a buffering role. It is unclear whether AEI could also be involved, due to a dearth of evidence simultaneously examining emotion-related skills, well-being, and use of social media. Regardless of the (limited) questionnaire-based studies examining EI and social media outcomes, a more process-based approach could reveal greater insight into how EI may safeguard well-being. One way that EI could contribute to adolescent well-being could involve facilitating ‘healthy’ ER on social media upon exposure to emotive material.

6.2.3 EI as a facilitator of emotion regulation on social media

There are emerging concerns that the heightened emotional sensitivity and protracted development of cognitive control in adolescents make them especially sensitive to the effects of emotion-arousing material on social media (Crone & Konijn, 2018). Qualitative research supports this; adolescents feel that social media can cause emotional distress through exposure to distressing, irritating, and/or upsetting emotive material (Weinstein, 2018). By increasing an individual’s exposure to negatively valanced material, social media could therefore negatively impact adolescent well-being (Best et al., 2014). Net Aware, a guide created by the National Society for the Prevention of Cruelty to Children (NSPCC) have emphasised that this is a prominent issue in the context of adolescent mental health (2017). For example, they report that 30% of young people often encounter violent or graphic content on social media (NSPCC, 2017). Furthermore, experimental evidence suggests that emotional states can be transferred on Facebook via passive exposure to emotive content

(Kramer, Guillory, & Hancock, 2014). When individuals were exposed to more positively-valenced statuses, they were more likely to express positive content themselves (with the reverse pattern shown for individuals exposed to negatively-valenced statuses). Whilst highly criticised for ethical shortcomings (Shaw, 2016), Kramer et al.'s (2014) study alluded to the large-scale risks of (even passively) consuming negatively-valenced content on social media. To safeguard well-being, adolescents need to engage with effective ER strategies to be able to react and respond to that encountered material appropriately.

While historically used to describe "offline" emotional responding, the notion of context-sensitive emotional responding could also apply online, and could suggest a way in which EI could help buffer the stressful effects of social media (i.e., by promoting ER strategies relevant to the context). A context-sensitive emotional response aligns with contextual demands (Flink, Boersma, Klein-Strandberg, & Linton, 2019), and is considered an important form of ER (Coiffman & Bonanno, 2010). When faced with positive (i.e., non-threatening stimuli), or negative (i.e., threatening stimuli), we need to present an appropriate response. Empirical evidence suggests that this type of regulatory flexibility is crucial for psychological adaptation (Bonanno & Burton, 2013).

A relevant body of literature here concerns the work examining EI and passive mood induction. Generally, TEI predicts increased PA in response to positive mood inductions, and increased negative affect (NA) in response to negative mood inductions (Lea et al., 2019), indicating an affective 'amplification' effect. For example, those with higher levels of TEI reported more negative emotions when watching a holocaust documentary (Petrides and Furnham, 2003), and an apartheid clip (Fernández-Berrocal and Extremera, 2006), compared to those with lower TEI. This was corroborated by Sevdalis et al. (2007, Study 1);

when participants were asked to recall a regrettable life decision, high TEI individuals presented a stronger negative affective reaction. However, there are some exceptions to the trend for increased negative affectivity. Ramos et al. (2007), Zysberg (2012), and Schutte et al. (2002, study 3) demonstrated that high TEI scorers were less reactive to emotive video, images, and negative written statements, respectively. The only study to use an adolescent sample in the review (Ciarrochi et al., 2001) found no association between TEI and mood changes while watching a negative film. Findings are also more complicated when studies consider TEI “profiles” - differing levels of multiple subscales, rather than global TEI or single subscales (Gohm, 2003; Papousek, Freudenthaler, & Schulter, 2008). For example, Papousek et al. (2008, sample 1) found that individuals scoring low on emotion perception, but high on emotion regulation, showed reduced less mood deterioration after viewing a sad emotional video clip. The reverse pattern was found for high perception but low on regulation. In essence, individuals who could perceive their emotions accurately, but not regulate them, were negatively affected by the sad film to a greater extent.

Similar conclusions cannot be drawn with respect to AEI due to the dearth of literature; only three studies have examined links between AEI and psychological reactivity. When shown either positive or negatively valenced emotional images, AEI had no effect on responses (Zysberg, 2012; Limonero et al., 2015). In the case of emotional videos, only one study thus far has examined AEI and reactivity via mood induction, and found that reactivity did not differ according to level of AEI in the case of negative mood induction (a video about dying from cancer), but that high AEI individuals felt more positive following a positive mood induction (a comedy clip) (Ciarrochi, Chan, & Caputi, 2000). However, all of the aforementioned studies took place in experimental settings, preventing generalisability. Analysis of the evidence base suggests that while EI (TEI in particular) is linked with context-sensitive responding (i.e., amplified affective reactions) in passive mood induction tasks, it is unclear whether this extends to AEI, adolescent samples, and applied settings (i.e., on social media). The above points discuss EI and affective responses, but there are other relevant ER processes that could apply to exposure to emotive material online, including those involving attention and situation selection (Gross & Thompson, 2007).

Turning next to attentional processes, theoretical principles posit that ‘healthy’ attentional processing embodies avoidance of threat in non-stressful conditions, but vigilance for threat under stressful conditions (Mogg & Bradley, 1998; Yiend, 2009). One might expect that, under non-stressful circumstances, when exposed to negatively-valenced content on social media (i.e., material that evokes anger, fear or some other negative emotion), a psychologically ‘healthy’ adolescent may be more likely to show avoidance behaviour (e.g., less likely to notice and engage with the content), yet be drawn towards the positively valenced content (i.e., material that evokes joy, pride, or amusement). In line with context-sensitive responding theory, EI *should* promote that pattern, thus safeguarding well-being. Indeed, during an ‘offline’ passive viewing task, high TEI individuals were drawn more towards positive faces and scenes than negative or neutral ones (Lea et al., 2018), further suggesting a potential role for TEI in directing attention towards positive content online under neutral conditions.

With respect to Gross’ ER framework, the decision of whether to engage or not engage with online material could be viewed as situation selection ‘in action’. Situation selection is a powerful ER strategy, that involves consciously choosing whether to approach or avoid emotionally relevant situations (Gross & Thompson, 2007). On social media, posts could be viewed as individual ‘situations’, since often, posts consist of a video preview (often captioned), which the user can click on to view the video in full. Thus, the user can decide whether to approach the situation (i.e., watch the video), or avoid it (i.e., scroll past it). Cognitive control – the ability to exert conscious control over cognitive processes - undergoes significant development in adolescence, and has the potential to influence the decision of whether to engage with different types of emotion-arousing media (Crone & Konijn, 2018). Adolescents with high levels of impulse control may be more proficient in consciously deciding whether to engage with certain types of material on social media (Luna, Paulsen, Padmanabhan, & Geier, 2013). Thus, AEI (especially the strategic branch), given its links with cognitive control, may be helpful in terms of inhibiting engagement with 'unhealthy' material (e.g., not watching a violent video shared on social media), as a way of regulating emotional response and avoiding the 'threat' (Checa & Fernández-Berrocal, 2019). Evidence suggests that high AEI (EM) individuals exhibit greater affective forecasting accuracy (i.e., have greater abilities to predict how a particular situation will make them feel) (Dunn, Brackett, Ashton-James, Schneidermann, & Salovey, 2007). On social media, those individuals could therefore make more informed choices on what to engage with, based on their ability to predict how engaging with material would make them feel. The experiential branch of AEI could also be important; adolescents with emotion perception ability could be more proficient in distinguishing between positive and negative social media posts (which could also inform stimuli selection).

Taken together, there is a need to explore whether EI relates to affective, attentional, and behavioural, responses to emotional material in adolescents, using ecologically valid stimuli with real-world implications for well-being (social media posts).

6.2.4 The present study

To date, empirical studies have shown that high TEI can be an important protective factor against the problematic use of smartphones, smartphone addiction, online gaming, and internet use more generally (Beranuy et al., 2009; Che, Hu, Zhen, Yu, Li, Chang, & Zhang, 2017; Kircaburun et al., 2019; Van Deursen, Bolle, Hegner, & Kommers, 2015). However, there is a dearth of research examining whether EI facilitates healthy ER on social media when adolescents are faced with highly emotive material. Given the need for a process-oriented approach to EI and stress (e.g., assessing how EI relates to ER in specific situations), exploring *how* EI might moderate ER on social media will explore a novel but promising mechanism through which EI could lead to psychological adaptation in young people. The present study aims to investigate whether EI moderates emotion processing upon exposure to emotive content on social media. Previous work into protective factors has predominantly focused on correlating scores on the individual difference with self-reported, retroactive social media use, without examining social media use 'in action', in real time (Seabrook et al., 2016). The present study examines whether EI predicts how adolescents self-report their affective response, attentional preference, and decisions to engage with, positive and negative posts on social media, using a naturalistic newsfeed designed specifically for the study. As with the other studies in the programme of research, the roles of both TEI *and* AEI are examined. Furthermore, to ensure a rigorous approach, other factors that could influence those variables are identified and controlled for. These included personality, and cognitive ability, akin to Studies 1 and 2. Participants' current mood is also controlled for, given that people preferentially process emotional stimuli that are congruent in emotional tone with their current mood, and the uncontrolled nature of the data collection environment (i.e., online) (Rusting, 1998; Yiend, 2009). Differences in impulse control - the inability to withhold a reactive or reflexive response in favour of more deliberative actions (Ainslie, 1975) – are also controlled for, given that they can contribute to social media behaviours (e.g., Wilmer & Chein, 2016). General indices of social media use are also accounted for, due to their links with well-being, including average *frequency* of use, and the *type* of use – the extent to which individuals use social media actively (i.e., to interact with other users) or passively (i.e., passively scanning content and profiles), (e.g., Frison & Eggermont, 2016). Finally, socially desirable responding is an important factor to consider for the present study. Whereas the previous two studies used a combination of subjective (e.g., self-reported mood; coping strategies) *and* objective outcome measures (e.g., HR; EDA; eye movements; reaction times), all outcome measures were self-reported in the present study. While this provides the participants with an opportunity to provide their own perspective on their behaviours, self-report measures rely on the participant providing honest, insightful responses (McIntire & Miller, 2000). However, the innate tendency of participants to provide socially desirable responses (i.e., to over-report positive behaviour, and under-report negative behaviour) (Hart, Ritchie, Hepper, & Gebauer, 2015) has the potential to influence the key outcomes of the present study, which are ultimately self-reported. For example, participants may under-report how likely they would be to watch negative violent or otherwise graphic videos on the social media task. Thus, desirable responding was also controlled for.

6.2.5 Aims and hypotheses

The aim of the present study is to test whether EI promotes well-being in adolescents by facilitating ‘healthy’ ways of processing emotive material on social media. To the researcher's knowledge, no studies have examined how EI moderates ER in relation to actual social media posts. Thus, there was a lack of literature upon which to the base decision-making regarding the operationalisation of constructs. While ER strategies range from "explicit, conscious, effortful, and controlled regulation (e.g., explicit coping strategies), to implicit, unconscious, effortless, and automatic regulation" (p.2, Gross, 2013), the present study focussed on the former category of processes, using self-report. Because so little is known about how EI may operate in an online context, it would make sense to investigate more deliberate forms of processing first, because there is substantially more literature available on EI and the more deliberate forms of ER, than automatic processes (Fiori, 2015; Maus et al., 2007). This means that any findings identified regarding EI and ER processes on social media will have a broader and richer context within which to be interpreted. Future research can then extend study to the more automatic processes. To map onto the conscious deliberate processes of Gross' model of ER (1998a), we developed 'proxies' for three ER strategies: emotional response modulation (i.e., the affective response to posts), attentional allocation (i.e., attentional preference for posts), and situation selection (i.e., likelihood of engagement with posts). These scores were generated using participants' self-reported responses to positively or negatively valenced posts (details of this process are provided in the method section). The study tests three specific hypotheses relating to those constructs. The first (**H1**), predicts that TEI, AEI (EM), and AEI (EP) should positively predict positive affective responses to positive posts, and negative affective responses to negative posts, based on the notion of context-sensitive responding (Coiffman & Bonanno, 2010). Second, **H2** predicts that TEI will predict an attentional preference for positive posts, based findings from a passive viewing task (Lea et al., 2018). Finally, **H3** predicts that AEI (EM) should predict less engagement with negative posts, due to AEI's relationship with cognitive control and affective forecasting (Checa & Fernández-Berrocal, 2019; Dunn et al., 2007).

6.3 Method

6.3.1 Design

The study used a cross-sectional design, whereby all participants completed the same battery of questionnaires and social media task, producing TEI and AEI as independent variables, and six dependent variables (aspects of ER). Six aspects of ER were investigated: affective response to positive and negative posts, attentional preference for positive or negative posts, and likelihood of engaging with positive or negative posts. These aspects map onto the 'response modulation', 'attentional allocation', and 'situation selection' families of ER described by Gross (1998a). As described in the introduction, those aspects of ER were selected because they may not only be pertinent to situations where adolescents are exposed to highly emotive material online, but may also relate to EI.

To establish ecological validity, the study was conducted online (i.e., social media is online, by its very nature). Moreover, online data collection is considered a valid and cost-effective way to conduct psychological studies with nationally representative participant pools (Simmons & Bobo 2015; Weinberg, Freese, & McElhattan, 2014), and participants attend to survey items equally well whether data is collected online or in-person (e.g., Ramsey, Thompson, McKenzie, & Rosenbaum, 2016). Age, subjective age, sex, social media use (frequency of use, type of use), desirable responding tendency, personality, cognitive ability, and impulse control, were measured and included as covariates in analyses where appropriate. Ethical approval was granted by the HASSREC at the University of Worcester in June 2018 (HASSREC code: HCA17180055). **Appendix O** provides an extended discussion on study design choices. For clarity, details on the participants and procedure are combined into one initial section, which is followed by descriptions of the measures used in the questionnaire battery.

6.3.2 Participants and procedure

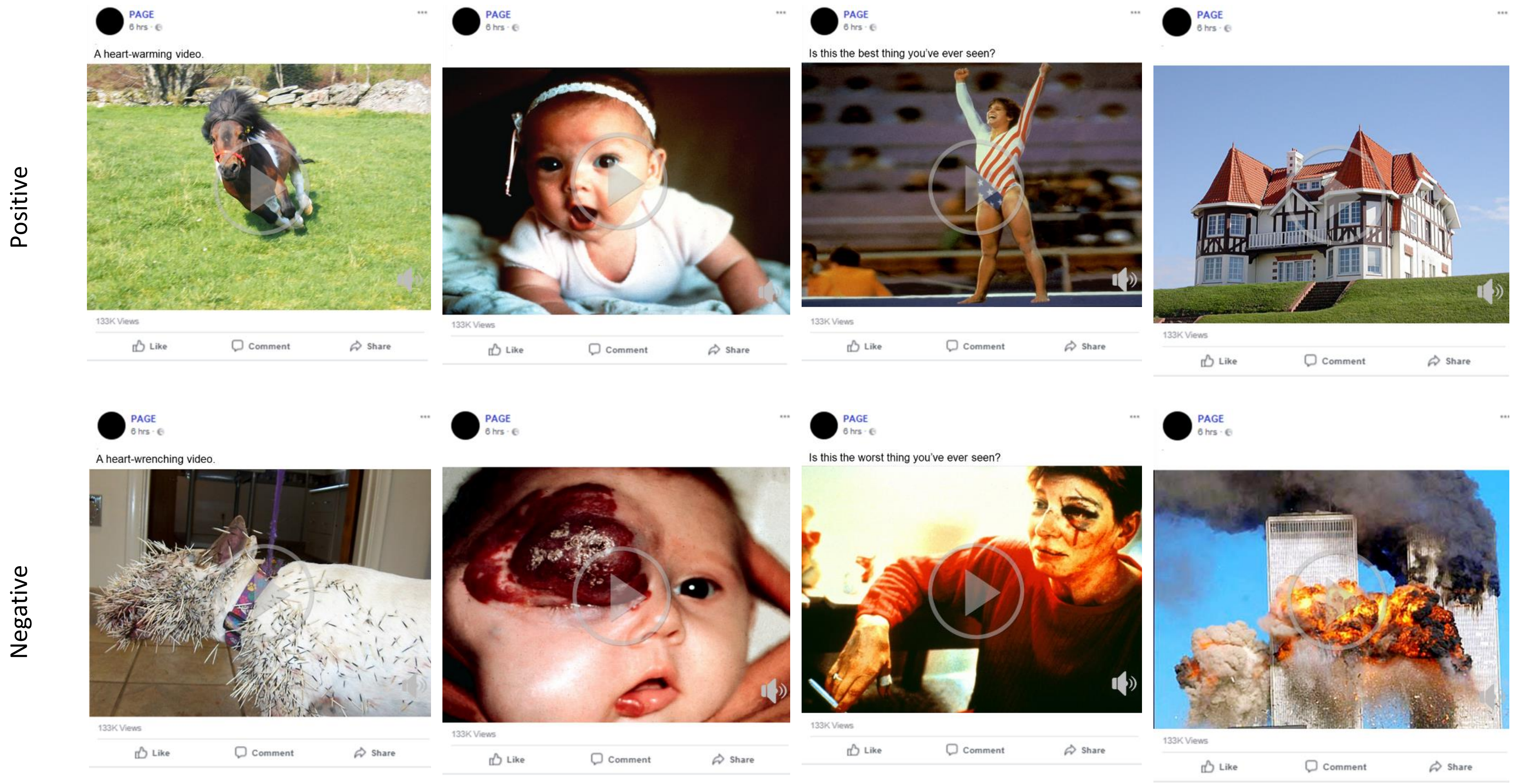
Preliminary *a-priori* power analyses conducted using G*Power (Erdfelder, Faul, & Buchner, 1996) suggested a minimum sample of approximately 157 participants was needed to achieve an 80% chance of detecting true effects for the main analysis (Field, 2017). Both offline and online recruitment strategies were used, featuring a core advertisement 'poster' which contained a direct link to the study (**Appendix B**). The study was advertised on the researcher's personal social media profile, and posted to relevant participant recruitment groups on social media platforms (Facebook, Reddit, Twitter, Instagram). The advertisement was also submitted for display on various non-commercial participant recruitment websites, such as Call for Participants (https://www.callforparticipants.com), Social Psychology Network (https://www.socialpsychology.org/expts.htm), and Psychological Research on the Net (https://psych.hanover.edu/research/exponnet.html). In terms of 'offline' recruitment, leaders of groups and clubs targeted towards young people (e.g., Girlguiding, Young Carers organisations, Youth Orchestras) were contacted via email (**Appendix B**) and asked to distribute flyers to young people in the target age range. Flyers were also distributed to local Sixth Form colleges and other venues commonly visited by young people (e.g., sports centres, community centres), and posters were displayed around other public areas, such as local coffee shops and supermarkets (**Appendix B**). No financial incentives were offered in exchange for completion of the study. A final sample of 189 participants completed the study (139 females, 45 males, 5 stated 'other'). Distribution of ages was well-balanced across the target age range: 45, 67, and 67 participants were aged 16, 17, and 18 years, respectively.

The entirety of the study was hosted online on Qualtrics.com. After accessing the link (either by clicking on a web-link or scanning the QR code on posters/flyers) participants were directed to an information sheet (**Appendix F**). After reading the information and providing informed consent, participants were asked to create a unique identifier (to enable them to request withdrawal of their data), and to indicate their sex, age, and subjective age. This was followed by a questionnaire battery, containing assessment of: TEI (TEIQue-ASF; 30 items), AEI (ERT; 36 items; STEM-B; 18 items), personality (BFI-10; 10 items), cognitive ability (Vocabulary Test; 18 items), social media use (PAUM; 13 items; Frequency of Social Media Use; 11 items); desirable responding (BIDR-16; 16 items); impulse control (SSCQ; 11 items), and SWB (SWLS; 5 items; SHS; 4 items). Measures were presented in a random order to counteract order effects (Lavrakas, 2008). The participant's current mood was then ascertained using the PANAS (20 items). Finally, participants completed a Social Media Task designed specifically for the present study, using images from the International Affective Picture System (IAPS; Lang, Bradley & Cuthbert, 2008), adapted to imitate video previews on Facebook posts. **Appendix O** provides details of how that task was constructed, including information about the stimuli selection/modification process, and a full list of the IAPS stimuli used in the study. Examples of the positive and negative stimuli developed for the Social Media Task are shown in **Figure 15.** The stimuli were presented to the participants as one continuous page (akin to a social media newsfeed). Participants were instructed to imagine they were scrolling through their personal social media newsfeed from top to bottom, at the pace they would normally do so. The order of the 'posts' was randomised for each participant. On the next page, participants viewed the same 'newsfeed' again, but this time were asked to retrospectively rate each 'post' based on their initial viewing. The ratings took place during the second viewing to allow for uninterrupted, 'naturalistic', initial viewing. Due to the potentially distressing nature of the stimuli, participants could exit the social media task at any time by clicking a button, which re-directed them to the debrief page.

For each post, participants answered three questions using a 7-point slider scale: 1) how the post made them feel (from 'negative' to 'positive'), 2) how likely they would have been to notice the post on their newsfeed (from 'not at all' to 'very much'), and 3) how likely they would have been to watch the video (from 'not at all' to 'very much'). Based on the responses to the three questions, summed scores were subsequently generated for the positive and negative stimulus categories: affectivity (from Question 1), attentional preference (from Question 2), and engagement (Question 3). Justifications for this approach to operationalising ER on social media, and details of how outcome variables were calculated, are located in **Appendix O**. In the final part of the study, participants were shown a short, comedic video (the same as that used in Studies 1 and 2) to restore mood, before reading a debrief statement. The final screen thanked participants for their time. It took participants approximately 35-40 minutes in total to complete the study.

Figure 15

Examples of Positive and Negative Stimuli Created for the Social Media Task, using Images from the IAPS (Lang, Bradley & Cuthbert, 2008).



Note. IAPS = International Affective Picture System (Lang, Bradley, & Cuthbert, 2008). Details of stimuli generation is provided in Appendix O.

6.3.3 Measures

Five of the measures used for Study 3 were consistent with those used for Studies 1 and 2 (**Table 20**). As with those previous studies, Study 3 yielded appropriate reliability statistics across all EI measures: TEIQue-ASF (.85), ERT (.83), and STEM-B (.75). Very good internal consistency values were also obtained for both the PA (.89) and NA (.88) scales of the PANAS. To avoid repetition of material presented in methods sections of earlier chapters, only the measures unique to the present study are described in the sections below. Full copies of all measures are available in **Appendix C**.

Table 20

Measures used Across Studies 1, 2 and 3

Construct	Study 1 (Chapter 4)	Study 2 (Chapter 5)	Study 3 (Chapter 6)
TEI	TEIQue-ASF	TEIQue-ASF	TEIQue-ASF
AEI (understanding)	STEU-B	-	-
AEI (management)	STEM-B	STEM-B	STEM-B
AEI (perception)	-	ERT	ERT
Personality	Mini-IPIP	Mini-IPIP	BFI-10
Cognitive ability	Vocabulary Test	Vocabulary Test	Vocabulary Test
Mental health and well-being	HADS	HADS	SHS; SWLS
Mood	PANAS	PANAS	PANAS
Physiological stress	Heart rate	Heart rate; EDA	-
State coping	CITS-S	-	-
Post-event rumination	-	Thoughts Questionnaire	-
Impulse control	-	-	SSRQ
Desirable responding	-	-	BIDR-16
Social media use	-	-	PAUM

Note. TEI = trait emotional intelligence; TEIQue = Trait Emotional Intelligence Questionnaire – Adolescent Short Form (Petrides, 2009); AEI = ability emotional intelligence; STEU-B = Situational Test of Emotion Understanding- Brief (Allen et al., 2014); ERT = emotion recognition test; mini IPIP = mini International

Personality Item Pool (Donnellan et al., 2006), BFI-10 = Big Factor Inventory (Rammstedt & John, 2007); HADS = Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983); SHS = Subjective Happiness Scale (Lyubomirsky & Lepper, 1999); SWLS = Satisfaction with Life Scale (Diener et al., 1985); PANAS = Positive and Negative Affect Schedule (Watson et al., 1988); EDA = electrodermal activity; CITS-S = Coping Inventory for Task-Based Stressors (Situational Version) (Matthews & Campbell, 1998); SSRQ = Short Self-Regulation Questionnaire (Neal & Carey, 2005); BIDR-16 = Balanced Inventory of Desirable Responding (Short Form) (Hart et al., 2015); PAUM = Passive Active Use Measure (Gerson et al., 2017)

6.3.3.1 Personality

Due to the length of the questionnaire battery used (**Table 20**), a brief personality measure was selected: the Big Five Personality Inventory-10 (BFI-10; Rammstedt & John, 2007; **Appendix C**). However, the substitution of the personality tool from the mini-IPIP still permits comparability between Studies 1, 2 and 3, since the personality inventories are underpinned by the same theoretical framework (i.e., Big Five Factor traits; Thalmayer, Saucier, & Eigenhuis, 2011). In the BFI-10, participants indicate to what extent 10 brief statements (two of which apply to each personality component) accurately describe themselves using a scale of 1 ('Disagree strongly’) to 5 (‘Agree strongly’). Items are preceded by 'I see myself as someone who…”, with examples including “has an active imagination” (openness), “does a thorough job” (conscientiousness), “is outgoing, sociable” (extraversion), “tends to find fault with others” (agreeableness), and, “gets nervous easily” (neuroticism). Internal consistencies have been acceptable-good in adolescents, with test-retest reliabilities of between .58-.83 (e.g., Lehenbauer-Baum, Klaps, Kovacovsky, Witzmann, Zahlbruckner, & Stetina, 2015; Spinath, Freudenthaler, & Neubauer, 2010). BFI-10 scores also correlate well with the full-length BFI-44, and show good convergent validity with longer measures that also assess the Big Five traits, such as the NEO-PI-R (Rammsted & John, 2007). Because Cronbach α values are quite sensitive to the number of items in the scale (Pallant, 2011), it is generally not recommended to calculate Cronbach's α values for scales of less than 5 items (Field, 2017; Taber, 2018). Thus, in line with recommendations for scales with a small number of items, the mean inter-item correlations for each Big Five trait) was calculated as an alternative estimate of internal consistency reliability (Pallant, 2011). The mean inter-item correlation was .326, with all inter-item correlations for each scale (i.e., between the two items for each Big Five trait) falling within the optimal range of .2 to .4 (Briggs & Cheek, 1986).

6.3.3.2 Socially desirable responding

The previous two studies used a combination of subjective (e.g., self-reported mood; coping strategies) *and* objective outcome measures (e.g., HR; EDA; eye movements; reaction times). However, as all outcome measures in the present study are self-reported, it is necessary to control for the comparably higher risk of socially desirable responding (Hart et al., 2015; McIntire & Miller, 2000). Socially desirable responding was captured using the Balanced Inventory of Desirable Responding - Short Form (BIDR-16) (Hart et al., 2015), a brief version of the Balanced Inventory of Desirable Responding (BIDR; Paulhus, 1991; **Appendix C**). The BIDR-16 was deemed the most suitable choice for the present study, since other commonly utilised measures (e.g., Marlow-Crowne Scale; Crowne & Marlowe, 1960) are criticised for their outdated item wordings (Beretvas, Meyers, & Leite, 2002), and lack multidimensionality, contradicting contemporary models of social desirability (e.g., Perinelli & Gremigni, 2016). The BIDR-16 incorporates two important aspects of socially desirable responding: impression management (IM; a *conscious* inclination to respond positively, to deceive others), and self-deceptive enhancement (SDE; an *un*conscious tendency to respond overly positively) (Paulhus, 1991). Participants rate their agreement with a series of 16 overly positive statements on a scale of 1 (Not true) to 7 (Very true), with 8 items each applying to IM (e.g., “I never cover up mistakes”, “When I hear people talking privately, I avoid listening”), and SDE (e.g., “I am a completely rational person”, “I never regret my decisions”). Higher scores on the respective scales represent greater tendencies to respond in a socially desirable manner. However, despite previous evidence suggesting that the reliability and validity of the BIDR-16 support its use as a substitute for the lengthier BIDR-40 in studies where length of assessment is a concern (Hart et al., 2015), Cronbach αs in the present study (SDE: .57; IM: .50) were only borderline acceptable, and were subsequently used with caution (Field, 2017).

6.3.3.3 Impulse control

Hypothetically, if a relationship is identified between EI and one of the outcomes of interest (engagement with emotional stimuli on social media), this could be attributable to an individual’s tendency to control their impulses. Regardless of EI level, participants that lack impulse control may be more likely to ‘give in’ to engaging with problematic/harmful material on social media (i.e., maladaptive *situation selection*) before carefully considering its emotional impact. The 11-item Impulse Control scale of the Short Self-Regulation Questionnaire (SSRQ) (**Appendix C**) was used to estimate individual differences in perceived control over impulses (Neal & Carey, 2005). The other scale of the SSRQ (Goal Setting Behaviour) was not relevant to the present study, and was thus not included. The self-control items ask participants to think about how they typically behave in relation to their impulses, using items including, “I usually think before I act”, “Often I don’t know what I’m doing until someone calls it to my attention”, and “It’s hard for me to notice when I’ve ‘had enough’ (alcohol, food etc.)”. For each item, participants respond on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Psychometric properties indicate the scale is a reliable index of perceived cognitive control (α = .84), and shows convergent validity with other measures of impulsivity, such as the Self-Control Schedule (Rosenbaum, 1980), and the Impaired Control Scale (Heather, Booth, & Luce, 1998) (Neal & Carey, 2005). Importantly, self-control scales tend to predict self-control *behaviours* (Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Schmeichel & Zell, 2007). However, it is noteworthy that the self-report nature of the Impulse Control Scale renders it susceptible to social desirability bias (i.e., participants often over-report how well they typically control their impulses), further supporting the inclusion of the BIDR-16, described earlier. A Cronbach's α value of .80 indicated the scale was highly reliable in the present study's adolescent sample.

6.3.3.4 Subjective well-being

Psychological functioning was operationalised via measures of SWB (an individual's subjective evaluations of their life; Diener, 1984), a multi-faceted construct, comprised of both affective (i.e., feelings: positive affect; happiness) and cognitive components (thoughts: judgements; satisfaction) (Davern, Cummins, & Stokes, 2007; Diener & Ryan, 2009; Luhmann, Hawkley, Eid, & Cacioppo, 2012). For this study, SWB was chosen over mental health disorder assessment, such as the HADS (Studies 1 and 2). Evidence suggests that while moderate social media use often does not result in psychopathology, it is more likely to present effects on SWB (Ferguson, 2017; Przybylski & Weinstein, 2017; Seabrook et al., 2016). Moreover, the majority of studies of social media and young people index adaptation through SWB (e.g., Best et al., 2014; Marino et al., 2018), which will help contextualise the findings of the present study. Furthermore, as the present study is conducting research in an applied setting, it makes sense to address mental health from a positive psychology perspective, as this is more accessible for practical application (i.e., social and emotional learning [SEL] interventions) (Salovey, Mayer, & Caruso, 2002; Seligman, Ernst, Gillham, Reivich, & Linkins, 2009). Adolescents' affective and cognitive SWB well-being was estimated using the two most popular and validated measures: the Subjective Happiness Scale (SHS; 4 items; Lyubomirsky & Lepper, 1999), and the Satisfaction with Life Scale (SWLS; 5 items; Diener, Emmons, Larsen, & Griffin, 1985). The SHS consists of four statements in which participants either self-rate themselves or compare themselves to others (e.g., “Compared to most of my peers, I consider myself: more happy/less happy”), whereas the SWLS contains five brief statements (for example, “In most ways my life is close to my ideal”). In line with recommendations for non-adult participants, the 3rd and 4th questions of the SHS that originally read, “To what extent does this characterization describe you?” were changed to, “How much does this sentence describe you?”, to improve readability (Holder & Klassen, 2010). In both the SHS and SWLS, participants indicated their answers using 7-point slider scales. Research has indicated that both the SHS (α = .90; van de Weijer-Bergsma et al., 2012) and the SWLS (α = .85; di Fabio & Gori, 2015) are highly reliable for use with adolescent participants. Furthermore, these scales have used alongside EI in a recent study (Szczygiel & Mikolajczak, 2017). The present study also yielded very good Cronbach α values (SHS; .88; SWLS; .85). Full copies are provided in **Appendix C**.

6.3.3.5 Indices of social media use

To assess frequency of social media use, participants were asked to estimate how frequently they use each of the 10 most popular platforms (Facebook, Twitter, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Snapchat, Google+, and Reddit). Responses were given using 7 response choices ranging from “I do not use this platform” to “I use this platform 5 or more times a day”, akin to Lin et al. (2016), with responses coded from 0 to 6. Responses across platforms were then summed to obtain a global frequency score (i.e., an index of typical daily social media use, with a potential range of 0 - 60). Sub-analyses were also conducted to examine platform-specific use (i.e., non-summed scores) and the variables of interest. To assess *how* participants use social media, the 13-item Passive Active Use Measure (PAUM; Gerson, Plagnol, & Corr, 2017) was used. Participants are asked “How frequently do you perform the following activities when you are on Facebook?” on a 5-point scale ranging from “Never (0%)” to “Very frequently (100%)”. If participants did not use Facebook (for which the measure is intended), they were instructed to answer in relation to their use of the social media platform they use the most. The PAUM produces scores for three scales: Active Social Use (e.g., “Commenting (on statuses, wall posts, photos etc.)”), Active Non-Social Use (e.g., “Creating or RSVPing to events”, and Passive Use (e.g., “Checking to see what someone is up to”) (see **Appendix C**). Internal consistencies of the scales are acceptable (.71-.77), show adequate test-retest reliability (.65-.76), and demonstrate discrimination validity against similar measures (Gerson et al., 2017). In the present study, the scales were also acceptable, yielding Cronbach’s α of .68 (Active Social Use), .78 (Non-Active Social Use) and .75 (Passive Use).

6.4 Results

6.4.1 Analysis plan

For the main analyses, hierarchical regressions were run to test whether EI predicted any of the six ER social media variables: (1) affective response to positive posts, (2) affective response to negative posts, (3) attentional preference to positive posts, (4) attentional preference for negative posts, (5) likelihood of engagement with positive posts, and (6) likelihood of engagement with negative posts. Big Five personality traits, cognitive ability, desirable responding, happiness, life satisfaction, and mood, were included as covariates in the first step of the regression. Next, EI (TEI, AEI emotion management [AEI(EM), or AEI emotion perception [AEI(EP)]) was entered in the second step. As with Studies 1 and 2, EI was operationalised as a continuous variable in all analyses, Bonferroni adjustments were not made, and exploratory analyses were carried out for TEI subscales. Based on the findings that emerged from the study, an exploratory, post-hoc mediation analysis was also performed, to investigate whether affective reactivity to posts mediated the relationship between EI and SWB. Mediation analyses provide one means of testing how EI may lead to positive life outcomes, and is common in the field (Matthews et al., 2006; Mikolajczak et al., 2008). Although structural equation modelling (SEM) would have allowed for the simultaneous testing of the above relationships, SEM guidance suggests a minimum of 200-300 participants to achieve a proper and reliable solution (e.g., Kline, 2011; Kyriazos, 2018; Tabachnick & Fidell, 2014).

6.4.2 Data screening and preparation

All responses (*n* = 518) were screened for response completeness. Although all questions were compulsory, a number of participants did not finish the questionnaire battery (and subsequently, the social media task) (*n* = 329), and these were subsequently removed from the dataset. Participants were retained if they had completed the entire questionnaire battery (i.e., all measures leading up to the social media task). Of the 189 participants in the final sample, 171 completed the study in full (i.e., the questionnaire battery *and* the social media task), of whom 130 were females, and 50, 61, and 59 participants were 16, 17 and 18 years old. The remaining 25 participants that completed the battery but did not finish the social media task were included in any additional analyses unrelated to the social media task. Participants that completed the study did not differ significantly in sex or age from those that did not (*ps* > .05). Interestingly, those that completed the entire study showed significantly higher mean scores for AEI (EP) (*M* = 70.84, *SD* = 15.42), than those that only completed the study in part (*M* = 63.43, *SD* = 18.80), $t(206) = 2.52$, $p = .012$. All other independent samples *t*-tests for completions vs. non-completions showed *p*s > .05.

Assumption checking was performed for each hierarchical regression (i.e., EI and social media, predicting well-being, EI and social media behaviour). All eight assumptions (Field, 2017) were met in every case. Dependent variables (e.g., reactivity to posts, frequency of social media use) were continuous, and predictors were either continuous or categorical (assumptions 1 and 2). There were linear relationships between the independent and dependent variables in each case, as indicated by partial regression plots (assumption 3). Residuals showed independence (assumption 4), visual inspection of studentised residuals versus unstandardised predicted values indicated homoscedasticity of residuals (assumption 5), and multicollinearity was not present, as tolerance values were greater than 0.1 (assumption 6). There were also no significant outliers (assumption 7). While a small number of studentised deleted residuals were greater than ± 3 standard deviations from the mean, no leverage values exceeded 0.2, and values for Cook's distance were less than 1, supporting the decision to retain these values in the dataset. All residuals (errors) were normally distributed, inferred through visual inspection of histograms (assumption 8).

6.4.3 Relationships between study variables

Whole-sample descriptive statistics and bivariate intercorrelations for all questionnaire variables (TEI, AEI, personality dimensions, cognitive ability, socially desirable responding, impulse control, and SWB) are displayed in **Table 21**. With the exception of cognitive ability, all variables were related to at least one TEI or AEI scale. This was expected, as these variables were included because evidence shows they covary with EI. Of note, there were strong positive correlations between TEI and both indices of SWB: happiness (r = .70, p < .001), and life satisfaction (r = .63, p < .001). This also applied to all TEI subscales (ps < . 001). Whereas AEI (EP) scores were not related to SWB (ps > .05), higher scores on AEI (EM) were related to higher life satisfaction (r = .16, p = .025). Impulse control was also positively related to TEI (r = .71, p < .001) and AEI (EM) (r = .24, p = .001). Desirable responding correlated positively with most self-reported variables. However, AEI (EP) (r = -.18, p = .014) and openness (r = -.17, p = .021) correlated *negatively* with the Impression Management desirable responding scale. Akin to Study 2, subjective age was measured to control for age-related differences in maturity and mind-set. How old participants ‘felt’ (i.e., their subjective age score) did not vary significantly between 16, 17, and 18-year olds (ps > .05). Covariates were included in the first step of all regressions: personality (BFI-10), cognitive ability (vocabulary test), current mood (PANAS), impulse control (SSRQ), frequency and type of social media use (PAUM), and socially desirable responding (BIDR-16). A correlation matrix of whole sample descriptive statistics and bivariate intercorrelations for EI and outcome variables are provided in **Table 22**.

Prior to testing the role of individual differences, paired t-tests were conducted to identify whole-sample patterns in the processing of positive and negative posts with respect to reactivity, attention, and situation selection. Unsurprisingly, individuals rated positive posts as making them feel significantly more positive (M = 4.77, SD = .83) than negative posts did (M = 1.71, SD = .64), t(151) = 32.89, p < .001. The attention of individuals was generally more drawn towards negative posts (M = 4.31, SD = 1.31) than positive posts (M = 3.98, SD = .94), t(163) = -2.80, p = .006. However, individuals reported that they would be less likely to engage with negative posts (M = 2.77, SD = 1.11) than positive posts (M = 3.77, SD = 1.06), t(163) = 8.42, p < .001.

Table 21

Correlations and Whole-Sample Descriptive Statistics for EI, Personality, Desirable Responding, Impulse Control, Cognitive Ability and Well-being (N = 189)

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. AEI: EP	.03	-	-	-	-	-	-	-	-	-	-	-	-	-
3. AEI: EM	**.18***	**.34*****	-	-	-	-	-	-	-	-	-	-	-	-
4. O	-.04	.12	.14*	-	-	-	-	-	-	-	-	-	-	-
5. C	**.45*****	.02	.00	-.04	-	-	-	-	-	-	-	-	-	-
6. E	**.38*****	-.04	.03	.10	**.24****	-	-	-	-	-	-	-	-	-
7. A	**.29*****	.14	**.19***	-.11	.16*	.04	-	-	-	-	-	-	-	-
8. N	**-.54*****	-.08	-.08	-.02	**-.23****	**.18***	**-.16***	-	-	-	-	-	-	-
9. DR1	**.38*****	.06	.08	**.26*****	**.61*****	**.67*****	**.44*****	-.02	-	-	-	-	-	-
10. DR2	**.21*****	**-.18***	-.08	**-.17***	**.29****	-.05	**.29*****	-.11	.19*	-	-	-	-	-
11. IMP	**.71*****	.12	**.24****	.03	**.50*****	**.22****	**.27*****	**-.38*****	**.37*****	**.28*****	-	-	-	-
12. GC	.07	.09	.12	.06	.09	.13	-.11	-.03	.10	-.14	.06	-	-	-
13. WB1	**.70*****	-.03	.06	-.02	**.39*****	**.41*****	**.27*****	**-.43*****	**.39*****	.08	**.49*****	.02	-	-
14. WB2	**.63*****	.07	**.16***	-.12	**.33*****	**.30*****	**.30*****	**-.32*****	**.31*****	.03	**.45*****	.08	**.73*****	-
M	4.32	70.32	9.73	6.82	6.41	5.57	6.92	7.03	3.12	3.90	29.49	60.06	4.15	20.24
(*SD*)	(0.76)	(15.78)	(2.73)	(1.71)	(1.75)	(2.19)	(1.74)	(2.15)	(.47)	(.80)	(6.93)	(5.95)	(1.36)	(6.81)
Range	2.07 – 6.03	5.56 – 94.44	.72 – 14.04	2.00 - 10.00	2.00 - 10.00	2.00 - 10.00	2.00 - 10.00	1.00 - 9.00	2.00 – 4.50	2.25 – 6.63	11.00 – 46.00	12.00 – 100.00	1.25 – 7.00	5.00 – 35.00
Skew	-.14	-2.02	-.94	-.11	.10	.20	-.71	-.53	.12	.23	-.16	-.01	-.09	.01
Kurtosis	-.40	4.51	.74	.23	-.28	-.70	.06	-.52	.20	.02	-.32	-.33	-.80	-.84

α	.85	.83	.75	NA	NA	NA	NA	.67	.60	.50	.80	.70	.88	.85

Notes. TEI = Trait emotional intelligence; AEI = ability emotional intelligence; EM = emotion management; EP = emotion perception; O = openness; C = conscientiousness; E = extraversion; A = agreeableness; N = neuroticism; DR1 = impression management; DR2 = self-deceptive enhancement; IMP = impulse control; GC = general cognitive ability; WB1 = happiness; WB2 = life satisfaction. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Table 22

Correlations for EI, well-being, and social media variables (N = 189).

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	**.64*** **	-	-	-	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	**.66*** **	**.17* **	-	-	-	-	-	-	-	-	-	-	-	-
4. TEI: SO	**.62*** **	**.42*** **	**.21** **	-	-	-	-	-	-	-	-	-	-	-
5. TEI: WB	**.85*** **	**.41*** **	**.50*** **	**.33*** **	-	-	-	-	-	-	-	-	-	-
6. AEI (EM)	**.18* **	**.17* **	**.14* **	.11	.10	-	-	-	-	-	-	-	-	-
7. AEI (EP)	.03	.06	.02	.00	.05	**.34*** **	-	-	-	-	-	-	-	-
8. WB1	**.70*** **	**.37*** **	**.39*** **	**.31*** **	**.77*** **	.06	-.03	-	-	-	-	-	-	-
9. WB2	**.63*** **	**.36*** **	**.14* **	**.31*** **	**.71*** **	**.16* **	.07	**.73*** **	-	-	-	-	-	-
10. AF_POS	**.32*** **	**.31*** **	**.39*** **	**.24** **	**.28*** **	**.27** **	-.05	**.37*** **	**.35*** **	-	-	-	-	-
11. AF_NEG	-.15	**-.28*** **	.05	-.15	-.12	**-.22** **	**-.31*** **	-.10	**-.22** **	**-.19* **	-	-	-	-
12. AT_POS	**.20* **	**.22** **	-.02	.12	**.18* **	-.02	-.08	**.28*** **	**.25** **	**.66*** **	-.14	-	-	-
13. AT_NEG	-.10	.06	-.04	-.07	**-.16* **	**.19* **	.10	**-.17* **	-.02	.13	-.03	.11	-	-
14. EN_POS	.14	**.18* **	-.06	.11	.12	.00	-.09	**.22** **	**.24** **	**.62*** **	**-.13**	**.86*** **	.04	-
15. EN_NEG	-.15	-.11	-.10	.02	**-.23** **	-.07	-.14	**-.16* **	-.15	-.06	**.40*** **	-.02	**.43*** **	.02

Notes. TEI = Trait emotional intelligence; EM = emotionality; SC = self-control; SO = sociability; WB = well-being; AEI = ability emotional intelligence; EM = emotion management; EP = emotion perception; WB1 = happiness; WB2 = life satisfaction; AF_POS = affectivity to positive posts; AF_NEG = affectivity to negative posts; AT_POS = attentional preference for positive posts; AF_NEG = attentional preference for negative posts; ENG_POS = engagement with positive posts; ENG_NEG = engagement with negative posts. * = *p* < .05, ** = *p* < .01, *** = *p* <.001.

6.4.4. EI and emotion regulation on social media

6.4.4.1 Hypothesis 1. TEI and AEI will predict stronger affective responses to social media posts

Two-step hierarchical regressions were conducted to determine if EI predicted affective responses to positive or negative posts (**Tables 23-25**). Separate regressions were conducted for each EI 'type' (i.e., TEI, assessed by the TEIQue-ASF, AEI (EM), assessed by the STEM-B, and AEI (EP), assessed by an ERT, for each type of posts (a total of 6 regressions). Covariates theorised to also influence ER on social media (personality, cognitive ability, socially desirable responding, impulse control, and SWB), were entered into the first step of each regression, such that the *incremental* effects of EI were being examined.

Stronger affective reactions to **positive** posts was only predicted by state PA (β = .21, p = .024), producing a statistically significant model (R^2 = .28, F(16, 132) = 3.16, p < .001, adjusted R^2 = .19). The addition of global TEI did not improve the model further (**Table 23**). Exploratory analyses were conducted, whereby the above was repeated with TEI subscales (emotionality, self-control, sociability, well-being), but none remained significant predictors at Step 2 (ps(ΔF) > .05). Turning next to AEI, the addition of AEI (EM) significantly predicted stronger positive responses to positive posts (ΔR^2 = 060, ΔF(1,131) = 3.99, p < .001, adjusted R^2 = .26), whereas AEI (EP) did not (p > .05) (**Tables 24**-**25**)

For reactivity to **negative** posts, SWB (life satisfaction) was the only significant covariate that predicted a stronger negative affective reaction to negative posts, resulting in a significant model (R^2 = .19, F(16, 143) = 2.04, p = .014, adjusted R^2 = .10). The addition of the TEI term did not significantly improve R^2 (ps > .05) (**Table 23**), whereas the addition of AEI (EP) did (ΔR^2 = .05, ΔF(1,141) = 2.52, p = .004, adjusted R^2 = .14). While the same was found for AEI (EM), whereby higher levels predicted stronger negative affective reactions to negative posts, its addition only marginally improved the model, $\Delta R^2 = .02$, $\Delta F(1,142) = 2.13$, $p = .080$, adjusted $R^2 = .11$ (**Tables 24** and **25**). When analyses were repeated for captioned and non-captioned positive posts separately, the same pattern of findings was observed (data not shown). In sum, higher scores for AEI (EM) predicted stronger affective reactions to positive posts, whereas AEI (EP), and AEI (EM) predicted stronger affective reactions to negative posts (albeit the latter only approached statistical significance).

6.4.4.2 Hypothesis 2: TEI will predict an attentional preference for positive stimuli

Two-step hierarchical regressions were conducted to determine if EI predicted attentional preferences for positive or negative posts (**Tables 23-25**). Separate regressions were conducted for each EI 'type' (i.e., TEI, AEI (EM), AEI (EP)), for each type of posts (a total of 6 regressions). Covariates were included in the first step. For attentional preference for **positive** posts, the only significant covariate was frequency of social media use ($\beta = .23$, $p = .007$), where greater use predicted preference for positive posts, yielding a significant model, $R^2 = .25$, $F(16, 143) = 2.99$, $p < .001$, adjusted $R^2 = .17$. The addition of TEI, AEI (EP), or AEI (EM) did not lead to an R^2 increase (*ps* > .05).

For attentional preference for **negative** posts, the covariates did not produce a statistically significant model ($R^2 = .15$, $F(16, 143) = 1.61$, $p = .074$, adjusted $R^2 = .06$). Furthermore, including the TEI term (**Table 23**), or the AEI (EP) term failed to improve R^2 ($p > .05$), but the addition of AEI (EM) did ($\Delta R^2 = .03$, $\Delta F(1, 142) = 1.85$, $p = .026$) (**Tables 24** and **25**). Findings were the same for captioned and non-captioned posts (data not shown). In sum, higher scores for AEI (EM) predicted greater attentional preference *for* negative posts.

Table 23

Summary Statistics for Regressions of Social Media ER Indices onto Covariates and Global TEI Predictors

	Step 1: Covariates		Step 2: TEI			Significant EI and covariate predictors (at Step 2)
Criterion	R^2	$F(16,131)$	R^2	ΔR^2	$\Delta F(17,130)$	
AF_POS	.28	**3.16*****	.28	.00	.53	PA (β = .22**)
AF_NEG	.19	**2.04***	.19	.00	.10	HAP (β = .04*)
AT_POS	.25	**2.99*****	.25	.00	.01	FREQ (β = .23**)
AT_NEG	.15	1.61	.15	.00	.02	None
EN_POS	.28	**3.41*****	.28	.00	.21	FREQ (β = .29**)
						PA (β = .20*)
EN_NEG	.15	1.54	.15	.00	.06	IM (β = -.19*)

Notes. ER = emotion regulation; PA = positive affect; HAP = SWB (happiness); FREQ = frequency of social media use; IM = desirable responding (impression management). AF_POS = affectivity to positive posts (higher scores = more positive reactions); AF_NEG = affectivity to negative posts (lower scores = more negative reactions); AT_POS = attentional preference for positive posts; AF_NEG = attentional preference for negative posts; ENG_POS = engagement with positive posts; ENG_NEG = engagement with negative posts. ** = p < .01; *** = p < .001.

Table 24

Summary Statistics for Regressions of Social Media ER Indices onto Covariates and AEI (Emotion Perception) Predictors

	Step 1: Covariates		Step 2: AEI (EP)			Significant EI and covariate predictors (at Step 2)
Criterion	R^2	$F(16,131)$	R^2	ΔR^2	$\Delta F(17,130)$	
AF_POS	.28	**3.16*** **	.28	.00	.68	PA (β = .19*)
AF_NEG	.19	**2.04***	.23	.04	**8.70****	AEI (EP) (β = -.24**)
AT_POS	.25	**2.99*****	.25	.00	.99	FREQ (β = .22*)
AT_NEG	.15	1.61	.17	.02	1.24	None
EN_POS	.28	**3.41*****	.28	.00	1.35	PA (β = .19*) FREQ (β = .27**)
EN_NEG	.15	1.54	.15	.00	.61	IM (β = .19*)

Notes. PA = positive affect; AEI = ability emotional intelligence; EP = emotion perception; FREQ = frequency of social media use; IM = desirable responding (impression management). AF_POS = affectivity to positive posts (higher scores = more positive reactions); AF_NEG = affectivity to negative posts (lower scores = more negative reactions); AT_POS = attentional preference for positive posts; AF_NEG = attentional preference for negative posts; ENG_POS = engagement with positive posts; ENG_NEG = engagement with negative posts. ** = p < .01; *** = p < .001.* = p < .05; ** = p < .01; *** = p < .001.

Table 25

Summary Statistics for Regressions of Social Media ER Indices onto Covariates and AEI (Emotion Management) Predictors

	Step 1: Covariates		Step 2: AEI (EM)			Significant EI and covariate predictors (at Step 2)
Criterion	R^2	$F(16,131)$	R^2	ΔR^2	$\Delta F(17,130)$	
AF_POS	.28	**3.16*****	.34	.06	**12.77*****	HAP (β = .33**) AEI (EM) (β = .29**)
AF_NEG	.19	**2.04***	.20	.01	3.11	AEI (EM) (β = -.15$^{\Delta}$)
AT_POS	.25	**2.99*****	.25	.00	.29	FREQ (β = .23**)
AT_NEG	.15	1.61	.18	.03	**5.05***	AEI (EM) (β = .20*)
EN_POS	.28	**3.41*****	.22	.00	.00	PA (β = .21*) FREQ (β = .30***)
EN_NEG	.15	1.54	.15	.00	.18	None

Notes. HAP = SWB (happiness); AEI = ability emotional intelligence; EM – emotion management; FREQ = frequency of social media use; PA = positive affect. AF_NEG = affectivity to negative posts (lower scores = more negative reactions); AT_POS = attentional preference for positive posts; AF_NEG = attentional preference for negative posts; ENG_POS = engagement with positive posts; ENG_NEG = engagement with negative posts. * = p < .05; ** = p < .01; *** = p < .001.

6.4.4.3 Hypothesis 3: AEI will predict less engagement with negative stimuli

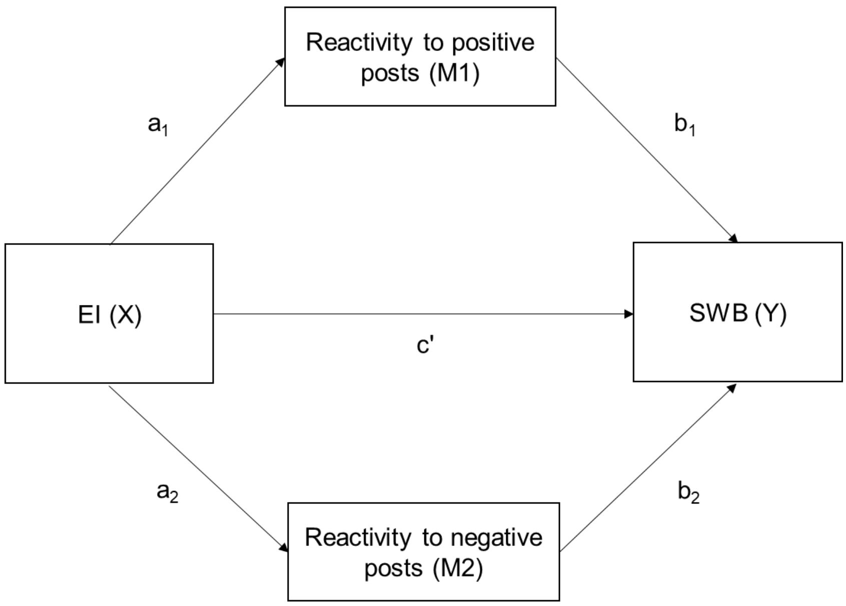
Two-step hierarchical regressions were conducted to determine if EI predicted likelihood of engagement with positive or negative posts (**Tables 23-25**). Separate regressions were performed for each EI 'type' (i.e., TEI, AEI (EM), AEI (EP)), for each type of post (a total of 6 regressions). Covariates were entered into the first step of that regression. For engagement with **positive** posts, the significant covariates were state PA (β = .21, p = .023), and frequency of social media use (β = .29, p < .001). Those variables produced a statistically significant model (R^2 = .28, F(16, 143) = 3.41, p < .001, adjusted R^2 = .19). The addition of TEI, AEI (EP), and AEI (EM), did not improve that model (*ps* > .05). Engagement with **negative** posts was only significantly predicted by desirable responding (impression management scale (β = -.19, p = .043), but the covariates failed to produce a statistically significant model (*ps* > .05). The subsequent addition of TEI, AEI (EP), and AEI (EM), also failed to significantly increase R^2 (*ps* > .05). Findings remained the same when captioned and non-captioned posts were analysed separately (data not shown). In sum, neither TEI, AEI (EP), nor AEI (EM) predicted likelihood of engagement with either positive or negative posts.

6.4.4.4 Exploratory analysis: Social media responding as a mediator between EI and SWB

A potential pathway through which EI could influence SWB through social media responding was tested using the PROCESS macro for SPSS (Model 4). To avoid conducting mediation analyses for all possible combinations of EI and aspects of ER (and thus increasing the risk of Type I errors), mediation models were constructed to test the only aspect of processing for which EI was consistently associated, and which predicted SWB (i.e., reactivity to posts), and the aspect of EI that predicted reactivity to posts (i.e., AEI). In the models, EI was entered as the predictor (X), SWB (either life satisfaction or happiness) was entered as the outcome (Y), reactivity to types of stimuli entered as a mediators (M), and the full set of covariates were included (with the exception of SWB, since this was the outcome) as described earlier in the chapter (see **Figure 16** for the basic mediation model being tested). The significance of indirect paths was assessed using 95% percentile bootstrap confidence intervals (CIs) with 10,000 bootstrap samples (Hayes, 2018), in line with recommendations for mediation analyses with small sample sizes (Creedon & Hayes, 2015). Two models were tested, with X representing AEI (EM), and Y representing either happiness or life satisfaction. That process involved calculating values for the a and b paths (**Figure 16**), the direct effect measures the extent to which X predicts Y, while M remains unaltered), and the indirect effects (the extent to which Y varies in relation to M, while X remains unaltered) (Hayes, 2018). The full mediation outputs are provided in **Appendix P**.

Figure 16

A Conceptual Diagram of the Mediation Model to be Tested



Models 1 and 2: AEI (emotion management)

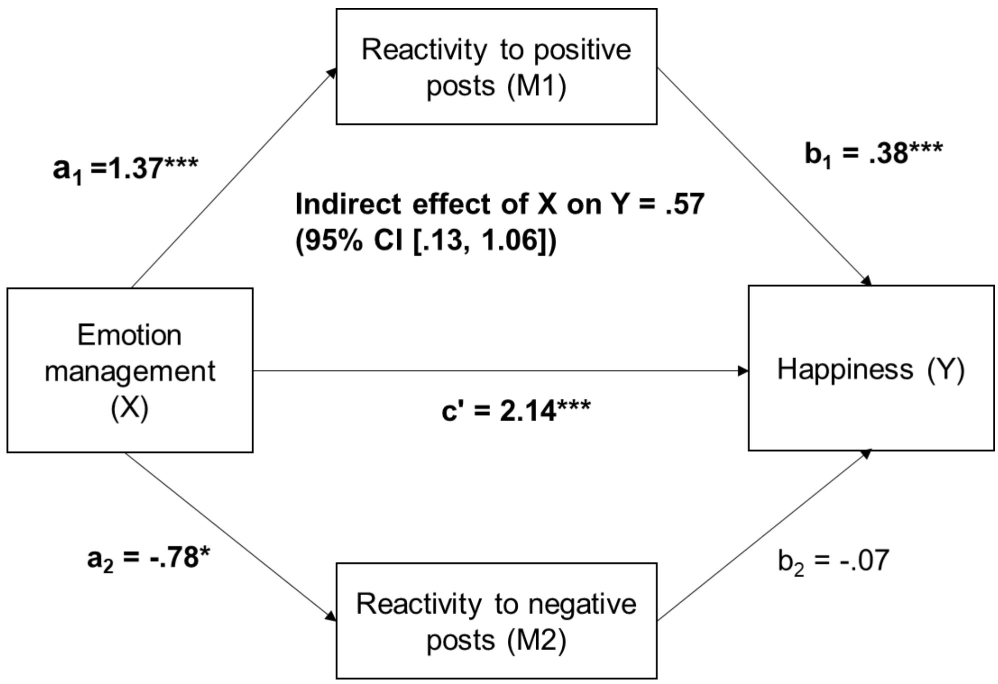
Regression analyses indicated that the *a* paths (regressing AEI [EM] onto reactivity to positive and negative posts) were significant a_1: $b = 1.37$, $SE = .48$, $p < .001$; a_2: $b = -.78$, $SE = .38$, $p = .045$.

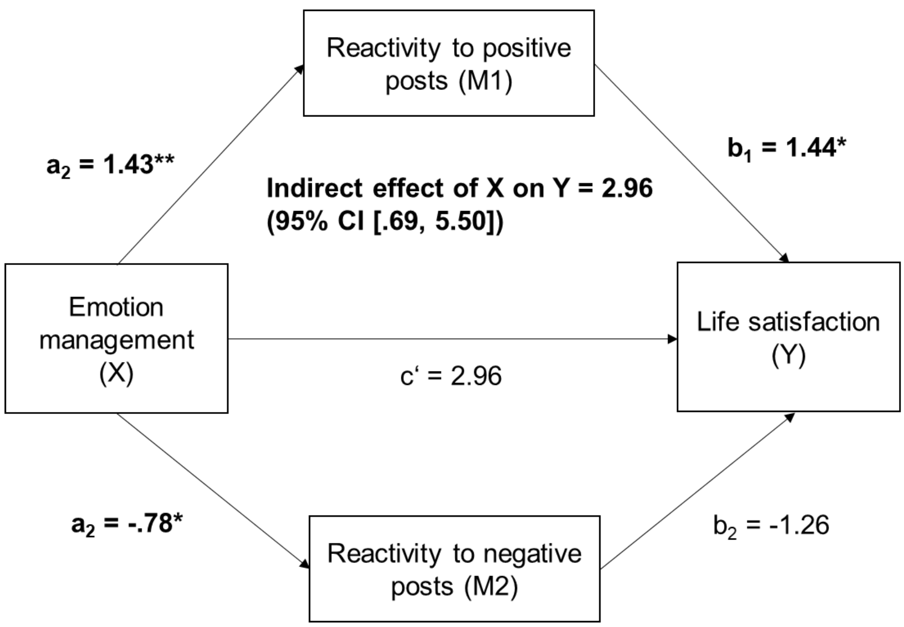
For **Model 1** (Y = happiness), all paths except b_2 were statistically significant. The b_1 path (regressing reactivity to positive posts, M1, onto happiness), b_1: $b = .38$, $SE = .11$, $p < .001$, was significant, indicating that positive emotional responses predicted happiness, whereas the b_2 path indicated that negative emotional responses to negative posts (M2) was not, $b_2 = -.07$, $SE = .14$, $p = .624$. In addition, there were direct effects (*c′*: $b = 2.14$, SE = .63, 95% CI [-3.39, -.89]), *and* indirect effects, which were observed for M1 (b =.52, SE = .23, 95% CI [.12 .97]), but not M2 (b =.05, SE = .11, 95% CI [-.17, .30]). Thus, the model suggests that AEI (EM) may predict adolescent happiness both directly *and* indirectly, by facilitating more positive emotional responses to positive posts on social media.

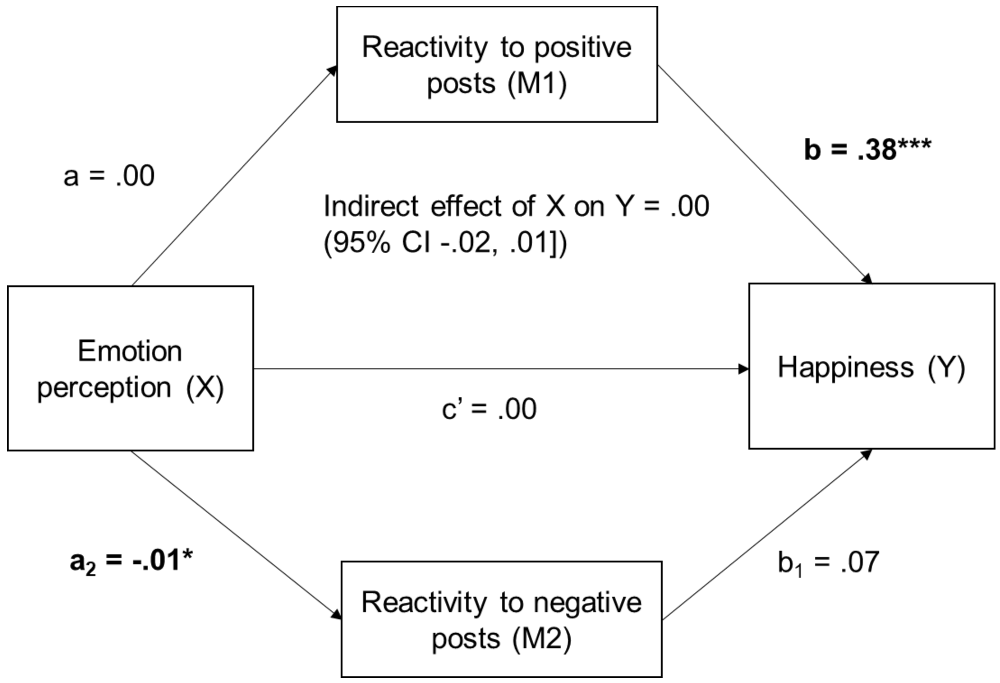
For **Model 2** (Y = life satisfaction), the b_1 path (regressing reactivity to positive posts onto life satisfaction, M1) was significant (b_1: $b = 1.45$, $SE = .64$, $p = .025$), but the b_2 path (regression reactivity to negative posts onto life satisfaction, M2), was not, b_2: $b = -.13$, $SE = .80$, $p = .116$. However, while there were no direct effects (*c′*: $p > .05$), there were *indirect* effects for both M1 (b = 1.98, SE = .98, 95% CI [.25, 4.07]) and M2 (b = .98, SE =.76, 95% CI [-.25, 2.71]). Those findings suggest that AEI (EM) may indirectly lead to increases in life satisfaction, through facilitating context-sensitive emotional responses to posts on social media. Taken together, the above findings suggest that adaptive affective reactions could be one way through which AEI (EM), relates to both affective SWB (i.e., happiness) and cognitive SWB (i.e., life satisfaction). Results suggest that mediation was full in the case of

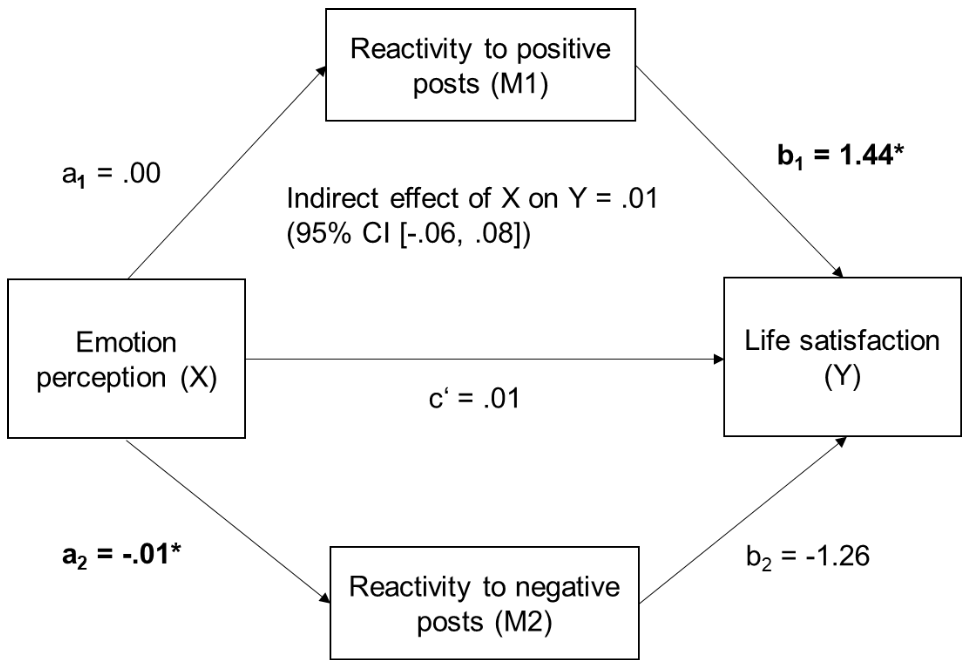
Figure 17

Conceptual and Statistical Diagrams of Mediation Models 1 (Top) to 4 (Bottom)






Reactivity to positive posts (M1)
a = .00
b = .38***
Indirect effect of X on Y = .00 (95% CI -.02, .01])
Emotion perception (X)
Happiness (Y)
c' = .00
a2 = -.01*
b1 = .07
Reactivity to negative posts (M2)


Reactivity to positive posts (M1)
a1 = .00
b1 = 1.44*
Indirect effect of X on Y = .01 (95% CI [-.06, .08])
Emotion perception (X)
Life satisfaction (Y)
c' = .01
a2 = -.01*
b2 = -1.26
Reactivity to negative posts (M2)

life satisfaction (i.e., significant indirect effect of X on Y, through M1 and M2, but no direct effects), but partial in the case of happiness (i.e., direct effect of X and Y, and indirect effect through M1), (Hayes, 2009; Rucker, Preacher, Tormala, & Petty, 2011). Statistical models are depicted in **Figure 17** (top two diagrams).

Models 3 and 4: AEI (emotion perception)

Regression analyses indicated that the *a* path (regressing AEI (EP) onto reactivity to positive posts) was not significant (a: $p > .05$).

For **Model 3** (Y = happiness). As reported for Model 1, the b_1 path, though not the b_2 path, was significant in regressing reactivity to posts onto happiness. Direct effects (*c′*: b = .01, SE = .01, 95% CI [-.02, .01) *and* indirect effects of AEI (EP) on happiness did not reach statistical significance for either M1 (b = .00, SE =.00, 95% CI [.00, .00]) or M2 (b = .00, SE =.00, 95% CI [.00, .00]) , suggesting that AEI (EP) does not predict adolescent happiness either directly or indirectly through via emotional responses to posts on social media.

For **Model 4** (Y = life satisfaction), as reported in the above sections for Models 1-3, paths a_2 and b_1 were significant, while a_1 and b_2 were not. There were no direct effects for AEI (EP) on life satisfaction (*c′*: b = .01, SE = .04, 95% CI [-.06 .08), and moreover, indirect effects for M1 (b = -.01, SE = .01, 95% CI [-.03, .01]) and M2 (b = .01, SE = .01, 95% CI [-.01, .04]) also failed to reach statistical significance. Findings suggest that AEI (EP) does not directly or indirectly predict adolescent life satisfaction, through emotional responding to posts social media. Statistical models are depicted in **Figure 17** (bottom two diagrams).

Taken together, the above findings suggest that how adolescents react to emotive material online may be one of many factors that could explain the relationship between AEI (EM) and bo th affective (i.e., happiness) and cognitive SWB (i.e., life satisfaction). Results suggest that mediation was full in the case of happiness (i.e., significant indirect effect of X on Y, through M, but no direct effects), but partial in the case of life satisfaction (i.e., direct effect of X and Y, and indirect effect through M) (Hayes, 2009; Rucker, Preacher, Tormala, & Petty, 2011). Overall, AEI (EM) appeared to contribute towards SWB (both life satisfaction and happiness) through reactivity to positive posts, whereas AEI (EP) did not.

6.5 Discussion of key findings

The present study used novel methods to investigate how EI might relate to ER when exposed to emotive social media posts. By implementing a bespoke newsfeed with naturalistic (but validated) stimuli, findings provide a unique insight into how the effects of EI can differ when research is conducted in controlled versus applied settings. Three distinct aspects of conscious ER were measured, operationalised as affective responding (i.e., how posts made adolescents feel), attentional preference (i.e., how drawn adolescents were to posts), and behavioural response (i.e., adolescents' likelihood of engaging with posts). **H1** (which posited that both TEI and AEI would facilitate context-sensitive emotional responding) was partially supported. Once confounding influences were controlled for, AEI was associated with amplified affectivity. Individuals that scored more highly on AEI (EM) reported stronger positive emotional reactions to positive content. That pattern not only constitutes context-sensitive responding, but exploratory mediation analyses revealed that AEI (EM) could potentially contribute to SWB (both life satisfaction and happiness) through that heightened positive affectivity. Whereas both AEI (EM) and AEI (EP) also predicted stronger negative emotional reactions to negative content, these effects were weaker. **H2** predicted that TEI would facilitate an attentional preference for positive posts, and was not supported by the findings. Unexpectedly, higher scores for AEI (EM) instead predicted greater attentional preference for negative posts, after covariates were considered. Finally, neither TEI, AEI (EM), or AEI (EP) predicted participants' self-reported tendency to engage with either positive or negative posts, which thus does not provide support for **H3** (which predicted that AEI [EM] would predict less engagement with negative posts). The key finding of the study was that AEI (EM) emerged as a facilitator of affective reactions to online content, and that this could be one way that AEI could protect adolescent well-being. Interestingly, the same finding applied whether the posts included captions or not, suggesting that the image-based features of social media posts were more pertinent to ER than text-based features.

6.5.1 EI as a facilitator of emotion regulation on social media

As described above, AEI (EM) emerged as a potential facilitator of adaptive ER on social media. As the key finding, analyses revealed that AEI (EM) related to a tendency to exhibit a greater *positive* affective reactions to *positive* social media posts (e.g., material designed to evoke happiness, amusement, joy). That pattern constitutes context-sensitive responding (i.e., exhibiting an emotional response relevant to the context; Coiffman & Bonanno, 2010; Flink et al., 2019), which is crucial for psychological adaptation (Bonanno & Burton, 2013). When faced with positive (i.e., non-threatening stimuli), we need to present an appropriate response. In neutral situations (i.e., in the absence of acute stress), individuals have an innate drive to upregulate positive emotions, and downregulate negative ones (Livingstone & Srivastava, 2012). Clearly, there are some situations where there is a need to decrease positive emotions or increase negative ones (Parrott, 1993). However, as a general rule, the majority of ER efforts in everyday life aim to maximise or maintain PA, and decrease NA (Gross, Richards, & John, 2006). That process involves upregulation (or 'savouring') of positive emotions, in order to prolong them or magnify their effect (Tugade & Fredrickson, 2007). Indeed, pro-hedonic ER can help buffer the short and long term physiological and psychological effects of stress (Folkman & Moskowitz, 2004; Fredrickson & Levenson, 1998), and is associated with positive mental health and well-being outcomes (Fussner, Luebbe, & Bell, 2015; Gómez-Baya, Mendoza, Paino, & Gillham, 2017). According to Fredrickson's Broaden-and-Build theory (2004), the cultivation and amplification of positive emotions can initiate an "upward spiral" that enhances well-being. Thus, the findings of the presents study could suggest that feeling more positive when exposed to non-threatening stimuli may act as a 'mood-booster' amidst the large amount of distressing, violent, or otherwise threatening material on their social media newsfeeds (Best et al., 2014; NSPCC, 2017). AEI (EM) could therefore facilitate ER on social media, helping young people to make the most of the positive material (i.e., maintaining positive mood) and compensate for the negative material.

Although several researchers have investigated how EI relates to the regulation of positive emotions, the focus has been primarily on TEI thus far (Quoidbach, Mikolajczak, & Gross, 2015). Multiple studies have demonstrated that TEI predicts adaptive affective responses, via downregulation of NA and upregulation of PA, leading to enhanced SWB (Gómez-Baya & Mendoza, 2018; Kong & Zhao, 2013; Sánchez-Álvarez, Extremera, & Fernández-Berrocal, 2015). In terms of specific strategies used, results indicate that TEI scores positively correlate with the use of 'savouring' strategies (i.e., positive emotion upregulation), and with dampening strategies (i.e., negative emotion downregulation); patterns that mediate the relationship between TEI and life satisfaction and happiness (Nelis, Kotsou, Quoidbach, Hansenne, Weytens, Dupuis, & Mikolajczak, 2011; Szczygieł & Mikolaczak, 2017). Whilst far outnumbered by the number of TEI studies, some studies have examined positive ER in relation to AEI. Extremera and Rey (2016), showed that both PA and NA levels mediated the relationship between AEI and life satisfaction. However, that study used the total score from the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Salovey et al., 2002), which does not indicate which aspects of AEI (e.g., emotion perception, emotion management) may be the most pertinent. The present study indicated that positive emotion upregulation played a key role in mediating the relationship between *emotion management* skill and SWB.

In addition, emotion management and emotion perception AEI branches predicted stronger affective reactions to *negative* posts (though the former branch was only marginally significant). In other words, compared to low AEI (EM/EP) individuals, high AEI (EM/EP) individuals reported that negative posts (e.g., those displaying violence, cruelty, or otherwise distressing content) produced strong negative emotion. Whilst that pattern did not correspond with higher life satisfaction or happiness levels in the present study (**Table 22**), it does still appear to reflect context-sensitive responding in the current paradigm (Coiffman & Bonanno, 2010; Flink et al., 2019), and showed indirect effects in the case of AEI (EM) and life satisfaction (mediation Model 2). The social media posts displayed highly distressing images (e.g., IAPS image 9810 shows a KKK rally; IAPS image 9187 shows a seriously injured dog) designed to evoke strong negative emotion (e.g., sadness, disgust, anger). 'Emotional blunting', 'emotional numbing', or 'reduced affect display' can be indicative of psychological disorder, or a side effect of certain psychoactive medications (Blair, Jones, Clark, & Smith, 1997; Fultz, Schaller, & Cialdini, 1988; Goodwin, Price, de Bodinat, & Laredo, 2017; Seara-Cardoso, Sebastian, Viding, & Roiser, 2015). It would therefore be maladaptive to *not* feel negative emotions in the response to material, and in that sense, AEI appears to confer adaptation by amplifying affective responses to both positive *and* negative posts on social media. The emotion perception branch of AEI involves the ability to identify discrete emotions in others and oneself, requiring the individual to accurately attend, detect, and decipher emotional signals (Papadogiannis et al., 2009). It therefore seems logical that being able to perceive emotion would correspond with context-sensitive emotion upregulation and downregulation: one needs to be able to correctly recognise the valence of a stimulus in order to facilitate the appropriate response. As proposed by emotion-as-information theory, subjective experiences are an important source of information (Schwartz, 2012). Displaying an appropriate emotional response (i.e., feeling the appropriate emotions in the appropriate situations) holds informational value for the individual (Storbeck & Clore, 2008). For example, correctly recognising a particular emotion in a stimulus (e.g., sadness from the IAPS image 2900 showing a boy who is upset) allows an individual to exhibit an appropriate response (i.e., feeling more NA), and may assist with thought processes (e.g., decision-making) and subsequent behavioural output (Storbeck & Clore, 2008). However, it is less clear how AEI (EM) would specifically contribute to that process.

As described in the introductory chapters, emotion management involves the ability to regulate one's own, and others', emotions effectively and as required/intended for the specific situation (Mayer & Salovey, 1997). As AEI (EM) is thought to aid the sophisticated, higher-level ('strategic') *cognitive* processes (Mayer et al., 2016), it is not intuitively clear how this could influence *affective* responses. Considering the additional unexpected finding – that AEI (EM) also predicted an attentional preference for negative posts – might shed light on this. As described in Chapter 5, 'healthy' attentional processing theoretically embodies avoidance of threat (i.e., attentional bias *away* from threat) in non-stressful conditions, but hypervigilance for threat (i.e., attentional bias *towards* threat) in acutely stressful conditions (Yiend, 2009). The current study was conducted in neutral conditions, whereby no specific emotional state was deliberately elicited. Therefore, in isolation, the finding that AEI (EM) signalled a tendency to be drawn more towards negative posts could suggest a maladaptive ER strategy. However, attentional preference for negative material may actually be normative for adolescents.

Evidence from developmental studies suggests that younger adults show a significant general information processing bias toward negative information (versus positive information), whereas older adults show the opposite pattern (Reed, Chan, & Mikels, 2014). In addition, in a later study that explored attentional deployment specifically, younger adults were more likely to direct their attention to negative stimuli, than older adults (Wirth & Kunzmann, 2018). In addition, the tendency of high AEI (EM) individuals to show attentional preference for negative posts did not translate into a greater likelihood of engaging with those posts. The 'engagement' variable aimed to capture situation selection, since with each post, the participant had to report whether they would *approach* the situation (i.e., watch the video), or *avoid* it (i.e., scroll past it). Situation selection is an effective strategy for regulating emotions, especially for individuals who otherwise struggle to do so (Webb, Lindquist, Jones, Avishai, & Sheeran, 2018). Thus, combined with the finding that AEI (EM) facilitates context-sensitive affective responding, one could speculate that noticing the negative content to a greater extent than positive could constitute an early 'defence mechanism', to enable the 'filtering out' of distressing material. However, an important caveat is that the study captured overt, deliberate attentional preferences, rather than preconscious, automatic attentional bias. Whilst a precise explanation for the link between AEI and attentional preference for negative material cannot be concluded from the present data, it is a finding that warrants further investigation.

While findings suggested a prominent role for AEI, preliminary analyses showed that aspects of TEI also significantly correlated with social media variables (**Table 22**). Global TEI (along with emotionality, sociability, and self-control subscales) were associated with positive affectivity to positive posts (akin to AEI). Furthermore, the *emotionality* subscale also correlated with negative affectivity to negative posts, attendance to positive posts, and greater likelihood of engagement with positive posts (reflecting the patterns shown by adolescents with higher levels of SWB; **Table 22**). Thus, emotionality - perceived abilities relating to recognition and expression of emotion in the self and others (Petrides, 2009) - showed promise in terms of reacting, attending, and engaging with social media posts in a beneficial manner. However, after covariates were included into the regression models, TEI (nor any subscales) was not a significant predictor of context-sensitive responding. Specifically, TEI effects may have been attributable to mood (i.e., generally higher PA). In other words, because high TEI individuals tend to have a higher positive mood at baseline (Studies 1 and 2; also see Schutte & Malouff, 2011; Schutte, Malouff, Simunek, McKenley, & Hollander, 2002), and the phenomenon of mood-congruent processing of emotion (Rusting, 1998; Yiend, 2009), PA could therefore underly the relationship between TEI and context-sensitive responding. Thus, it may not be that having high TEI is detrimental or unhelpful, but, rather, that AEI produces more of an incremental effect beyond allied constructs.

6.5.2 Implications for adolescent well-being

The findings of the present study suggested that EI's relationship with positive ER strategies to maintain or amplify PA (and subsequently promote well-being) may also apply to a social media context. As described earlier in the chapter, exposure to distressing, irritating, and/or upsetting emotive material on social media can induce emotional distress in young people, exacerbated by the presence of hallmarks that characterise adolescence, including heightened emotional sensitivity, and protracted development of cognitive control (Crone & Konijn, 2018; NSPCC, 2017; Weinstein, 2018). AEI seems helpful in that respect.

As discussed in Chapters 1-3, the overarching hypothesis of the thesis is that EI may buffer the effects of adversity (acute stress) on life outcomes in adolescents by moderating ER processes. In the present study, 'stress' was conceptualised as social media stress, namely the exposure to distressing material on social media newsfeeds. The 'ER processes' being examined were the conscious processes related to the affective response, attentional preference, and situation selection, which tapped various aspects of Gross' model of ER (1998a). AEI (EM) related to context-sensitive responding (an adaptive ER strategy; Coiffman & Bonanno, 2010), whereby adolescents that possessed knowledge about emotion management (as assessed by the STEM) exhibited appropriate emotional responses to social media posts. As indicated by a R^2 change of .08, AEI (EM) explained 8% of the incremental variance in the emotional responses to positive social media posts, but only 1% of the variance in emotional response to negative posts. Thus, AEI may be more pertinent to positive ER strategies than negatives ones. In addition, those adolescents tended to be preferentially drawn to the negative stimuli. Taken together, findings could suggest one of multiple potential pathways to well-being via social media: adolescents with high AEI (EM) could utilise ER strategies that amplify the emotional experiences (e.g., by upregulating positive affectivity to positive posts), as well as through the strategies that initially direct attention to negative stimuli (perhaps to quickly 'filter out', since engagement with posts was unrelated). Furthermore, the study findings tapped both the cognitive *and* affective components of SWB, suggesting that these mechanisms benefit hedonic well-being in adolescents in a fairly general sense (McMahan & Estes, 2011). Tentatively speaking, findings suggest that socio-emotional competency could be a valuable protective factor for adolescents' well-being in the context of social media. However, findings cannot be generalised to social media platforms other than Facebook. Other platforms popular with young people (e.g., Instagram, Snapchat) present content in different formats, and evidence suggests that each platform relates to adolescent well-being differently (e.g, RSPH, 2017; Vannucci & Ohannessian, 2019; Utz, Muscanell, & Khalid, 2015). Therefore, it cannot be assumed that EI would relate to emotion processing on all social media platforms in the same way.

6.5.3 Limitations

An important caveat to the study is that the findings cannot confirm with certainty whether EI confers adaptivity on social media. The findings of the present study were interpreted in line with broad emotion theory, given the dearth of evidence around patterns of social media use and well-being. Nonetheless, it is difficult to identify which ways of processing are truly adaptive, since this is dependent on the individual and their immediate goals. The notion of adaptive ER is that it provides some benefit to the individual in that particular situation (Schramm & Wirth, 2008). With respect to online ER, a prominent theory within media psychology is Zillmann's mood-management theory (MMT; Zillmann, 1988), which predicts that people largely turn to media for *hedonistically* motivated ER, via entertainment offerings. According to the MMT, individuals selectively expose themselves to media which helps them upregulate PA and downregulate NA (Reinecke, 2016). However, this is likely an oversimplification, since the emotion literature suggests the effectiveness of chosen ER strategies is tied to the social context, and the nature of the goal to be achieved, which can be interpersonal (e.g., to avoid conflict), hedonic (e.g., to feel better), or instrumental (e.g., getting work done) (English, Lee, John, & Gross, 2016). Due to the uncontrolled nature of the data collection environment (akin to 'natural' social media use), there may be no 'rule' as to what entails an adaptive response to a social media post for a particular adolescent, at any one point in time. For example, an adolescent may be in a situation where *downregulation* of positive emotion would be helpful. Imagine a situation where a young person looks to social media for a calming/grounding effect before studying for an important test (i.e., an instrumental goal). This outcome is unlikely to be achieved by attending to pro-hedonic material, which could perpetuate overly positive emotions, making it difficult to study afterwards (Parrott, 1993). Whilst that example is quite specific, it offers one potential situation where the study may not have captured adaptive responding. It is also not possible to have direct oversight into participants mood at the time of the study in online settings (BPS, 2017), which is problematic given that affective state is thought to be an important determinant of how individuals use social media (Greenwood & Long, 2009). However, the study attempted to somewhat counteract this by measuring and controlling for current mood through administration of the PANAS (Watson et al., 1988).

Another limitation with the present study relates to the mediation analysis. While affective reactions to social media posts mediated the relationship between AEI and SWB, it does not allow for causal relationships to be inferred. There are likely many other intervening variables and factors that were unaccounted for in the present study, though the dearth of evidence in the area means the identity of those factors is unknown. Furthermore, the relationship could be in the other direction; adolescents with greater SWB may show adaptive ER on social media (i.e., SWB may be the mediator). Further investigation is necessary to establish the full nature of the relationship between EI, ER, and well-being, in a social media context.

Finally, the outcome variables of the present study were obtained through self-report; participants rated how posts made them feel, how drawn they were to each post, and how likely they would be to engage with posts if they were encountered in a naturalistic setting. Thus, there was a possibility that participants may have responding in a socially desirable manner (i.e., to over-report positive behaviour, and under-report negative behaviour) (Hart et al., 2015). For example, participants may under-report how likely they would be to engage with negative emotional posts on the social media task. TEI scores can also be prone to distortion through the phenomena of socially desirable responding (e.g., Day & Carroll, 2007; Grubb & McDaniel, 2007; Tett et al., 2012). However, this issue was lessened through including a measure of socially desirable responding (the BIDR-16; Hart et al., 2015) that captured individual differences in impression management, and self-deceptive enhancement. Using the current set of findings as a foundation, future research could extend investigation to examine the relationship between EI and objective measures of ER on social media. For example, attention to posts could be measured using eye-tracking, and real-time clicks and/or viewing time could determine engagement with posts. In isolation, the conclusions about EI and social media cannot be drawn confidently; using more objective measures in future studies would help to strengthen the findings.

In conclusion, findings suggested a prominent role for AEI when adolescents are faced with emotive material on social media. Adolescents skilled at managing their emotions (i.e., high AEI) tended to show adaptive (context-sensitive) emotional responses to social media posts, which may contribute to a greater sense of well-being and life satisfaction. However, adolescents with high AEI (EM) reported feeling drawn more towards negative posts, an attentional preference that could be viewed as maladaptive. The adaptive value of that pattern is difficult to decipher, as that initial allocation of attention did not translate into a greater tendency to engage with negative material, and could therefore perhaps indicate a potential early ‘defence’ mechanism. In sum, AEI seems to moderate the conscious emotional processing of emotive stimuli on social media. This contrasts starkly to the findings found for the experimental Studies 1 and 2, which highlighted the role of TEI. Thus, it would appear that in applied settings, actual emotional skills (i.e., AEI) may be more pertinent to ER than emotional personality (i.e., TEI). Future research should build on those findings to investigate whether they also apply to content from other social media platforms, or when objective measures of ER are used.

CHAPTER SEVEN

GENERAL DISCUSSION

7.1 Chapter overview

The research set out to explore potential affective, cognitive, and physiological mechanisms through which EI may lead to adaptive acute stress regulation in older adolescents. Findings were mixed, but suggested that EI may be advantageous in certain contexts, with effects contingent on EI conceptualisation, type of stressor, and outcome measure. Furthermore, findings demonstrated that EI makes clear contributions towards the prediction of stress regulation beyond the Big Five personality traits and cognitive ability, demonstrating its incremental validity. This chapter presents a detailed analysis of the research findings as they pertain to three key themes: 1) the nature of EI in adolescence, 2) EI as a protective resource in adolescence, and 3) the measurement of EI in adolescence. Contributions to knowledge are then considered, followed by a review of the limitations of the research. Discussion closes by suggesting future directions of the field.

7.2 Summary of key findings

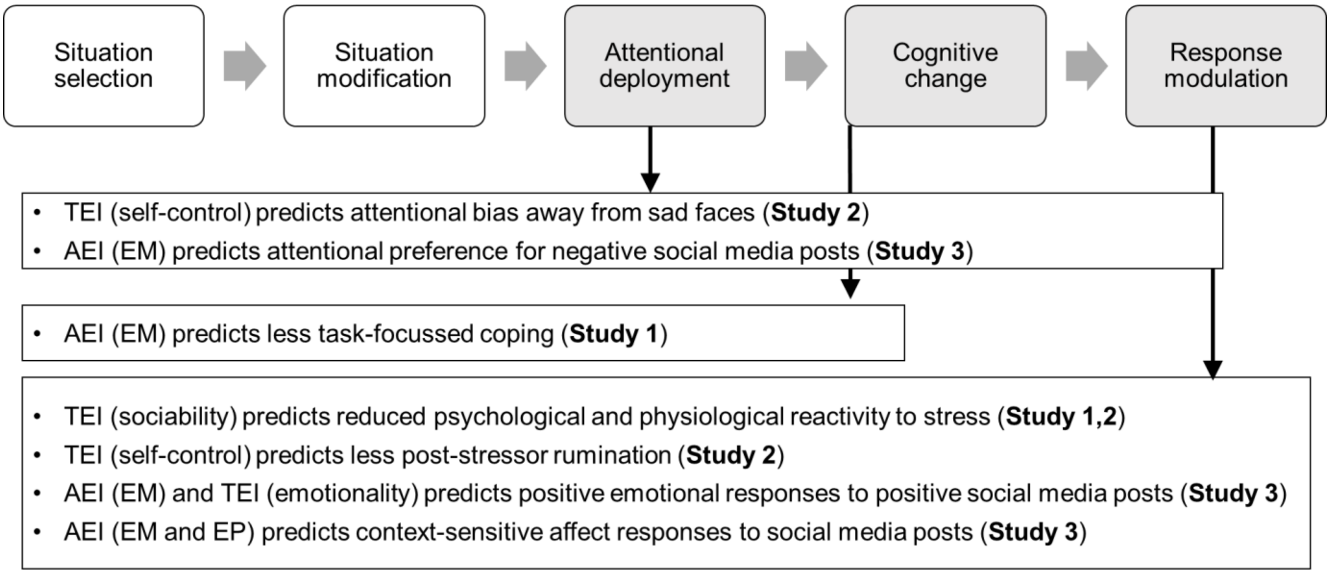
As a time of ‘storm and stress’, adolescence can produce substantial emotion regulation (ER) challenges for some young people (Ahmed et al., 2015; Riediger & Klipker, 2014). However, the ability to navigate normative everyday stressors differs markedly between individuals (Luthar et al., 2006; Wright et al., 2013), with some ‘resilient’ adolescents demonstrating positive adaptation in the face of adversity (e.g., Masten et al.,1999). Contextualised within a resilience framework, research has begun to investigate EI as a protective marker that operates within stress regulation pathways to lead to positive life outcomes in young people (e.g., Ciarrochi et al., 2002; Davis & Humphrey, 2012a; 2014;

Mikolajczak, et al., 2006). However, to rigorously investigate *how* and *when* EI contributes to stress regulation, there was a pressing need to conduct more process-oriented EI research (Peña-Sarrionandia et al., 2015). The present programme of research tested the possibility that EI may lead to resilience in adolescence by facilitating adaptive stress regulation processes (Davis, 2018a; 2018b).

Several key findings emerged from the research, each of which were contingent on how EI was measured, the ER process being examined, and the context. **Figure 18** shows the significant findings of the research, mapped onto Gross' ER model (1998a). When conceptualised as a trait, EI was pertinent to stress regulation in some circumstances, but significant findings were usually restricted to certain TEI subscales. Analysis of the pooled sample from Studies 1 and 2 revealed that the sociability subscale of the Trait Emotional Intelligence Questionnaire - Adolescent Short Form (TEIQue-ASF; Petrides, 2009) was important in helping adolescents modulate their emotional and physiological response to psychosocial stress. When exposed to an acute stressor with a strong sense of social evaluation (the Sing-a-Song Stress Test; Brouwer & Högervorst, 2014), higher levels of trait sociability were associated with smaller increases in negative affect (NA) and heart rate (HR). However, the self-control subscale was the strongest predictor of *attentional* allocation, whereby higher levels corresponded with a general avoidance of sad faces, and less rumination post-stressor (Study 2). Turning to ability EI (AEI), adolescents that scored higher on the Situational Test of Emotional Management - Brief (STEM-B; Allen et al., 2015) demonstrated adaptive coping in controlled settings (Study 1), and more context-sensitive emotional responding in an applied setting (on social media; Study 3). Notable themes and issues arising from the research, concerning the nature and measurement of EI in adolescence, will now be explored. A discussion of the key contributions to knowledge, limitations, and future directions, follows.

Figure 18

Significant Findings Mapped onto Gross' (1998a) Model of ER



Note. TEI = trait emotional intelligence; AEI (EM) = ability emotional intelligence (emotion management); AEI (EP) = ability emotional intelligence (emotion perception).

7.3 The nature of EI in adolescence

Findings from the present research lend credence to the construct differentiation of EI, extended to late adolescence. As expected, whole-sample trait EI scores were unrelated to AEI (EP) scores, and weakly correlated with *AEI (EM)* scores (*r*s. .12-.26, *ps* < .05). Whilst AEI branch scores were obtained through separate measures (i.e., STEM; emotion recognition test; ERT), rather than from a single measure (i.e., Mayer-Salovey-Caruso Emotional Intelligence Test [MSCEIT]; Salovey et al., 2002), that pattern still replicates that found in young adolescents (Barlow, Qualter, & Stylianou, 2010; Qualter et al., 2012), and adults

(Brackett & Mayer, 2003; Davis & Humphrey, 2012a; O'Connor & Little, 2003; Warwick & Nettlebeck, 2004). The consistently low correlations between TEI and AEI reported in the literature (and indeed the present research) indicates that the constructs appear to be relatively independent of one another. The present findings reinforce the notion that conceptual differences between the AEI and TEI exist in adolescence, and that this extends to *late* adolescence. Importantly, findings indicated that each construct operates differently with respect to stress regulation, as will be discussed in a later section. First, an examination of relationships between EI and allied constructs is necessary, to consider whether the conceptual frameworks suggested for TEI and AEI, with respect to their parent constructs, hold true for the current data.

The AEI approach conceives EI as a form of intelligence, where the content domain is emotions, similar to how numbers or words represent the content domains of numerical and verbal abilities, respectively (Mayer et al., 2016). In line with theoretical predictions, EM and EP abilities converged with each other (r = .31, p < .001), suggesting that these are distinct yet related skills (Elfenbein & MacCann, 2017). Because AEI represents cognitive abilities specialised for reasoning about emotion, AEI should only *weakly* relate to personality, but share moderately positive associations with general cognitive ability (Mayer et al., 2008). In the present research, cognitive ability (specifically, crystallised intelligence; Gc) was measured using one of the 18-item Vocabulary tests from the Kit of Factor-Referenced Cognitive Tests (Ekstrom et al., 1976), an objective, standardised measure of g. Unexpectedly, however, whole-sample analysis revealed that Gc scores only weakly correlated with emotion management (r = .13, p = > .05), and emotion perception scores (r = .11, p = > .05). While that seems to contradict theoretical predictions, a meta-analysis that encompassed all types of AEI and IQ-type Gc instrumentation found similarly sized effects (AEI [EP]; *r* = .10; AEI [EM], *r* = .16) (Joseph & Newman, 2010). Moreover, individual studies that shared methodological similarity with the present research replicated current findings. In one study that used the same vocabulary test as the present research alongside the MSCEIT (Farrelly & Austin, 2007), relationships between Gc and those AEI branches were often small (i.e., all *r*s < .22). In addition, Austin (2010) found that correlations between vocabulary test scores were only .12 (STEM), and -.08 (perception branch of MSCEIT). Thus, although the current findings did not meet *theoretical* expectations with respect to AEI and cognitive ability, they appeared they aligned with *empirical* findings of other researchers that have utilised similar measures.

By contrast, the current data found that AEI negligibly related to the Big Five personality traits, in line with theoretical principles (Austin, 2010). Specifically, neither of the AEI branches significantly corresponded with extraversion, conscientiousness, or neuroticism. However, relatively small associations were detected for agreeableness (emotion management, *r* = .23; emotion perception, *r* = .13) and openness (emotion perception, *r* =.14). These patterns markedly correspond with those documented in previous research (e.g., Austin, Farrelly, Black, and Moore, 2007; Brackett & Mayer, 2003; Davis & Humphrey, 2012b; Fiori & Antonakis, 2011; van der Linden et al., 2017; Zeidner & Olnick-Shemesh, 2010), and generally support the notion that the AEI model exists outside of a personality framework, in contrast to TEI (Caruso, Mayer, & Salovey, 2002).

Across all three studies, TEI was measured using the TEIQue-ASF, an age-appropriate, short measure of TEI from the TEIQue family of measures; Petrides, 2009), and (in addition to a global score), yields scores for four emotional self-perception factors; self-control, sociability, emotionality, and well-being (Petrides, 2009). As anticipated, TEI (and all subscales) were unrelated to Gc (all *r* values were under .10). Since TEI represents a constellation of emotional self-perceptions assessed through self-report questionnaires, rather than maximal performance, findings reinforce the viewpoint that TEI is not a form of intelligence (Austin, 2010), and correspond with findings reported elsewhere (e.g., Farrelly & Austin, 2007; Ferrando et al., 2010; Mavroveli et al., 2008; Mikolajczak et al., 2007; Qualter et al., 2012). Rather, the consensus is that TEI is located at the lower levels of personality hierarchies (De Raad, 2005; Petrides & Furnham, 2001; Petrides et al., 2007 Petrides et al., 2016), and that global scores should correlate substantially with several of the Big Five personality traits. Indeed, the current research identified that TEI (and subscales) showed medium-large correlations with conscientiousness ($r = .44$, $p < .001$), extraversion ($r = .35$, $p < .001$), agreeableness ($r = .30$, $p < .001$), and neuroticism ($r = -.58$, $p < .001$). The relationship with openness was much weaker ($r = .06$, $p > .05$). Those patterns reflect those present in the literature (e.g., Austin et al., 2007; Davis & Humphrey, 2012b). Furthermore, the *magnitude* of coefficients obtained (medium to large) match those returned by meta-analyses examining TEI and personality (Joseph & Newman, 2010; van der Linden et al., 2017; van Rooy & Viswesvaran, 2004). Thus, present findings compare favourably with that of others, and suggest that in late adolescence, TEI shares much the same conceptual framework with that of adulthood, with respect to its parent constructs (i.e., Big Five traits). In addition to relationship with allied constructs, it is important to check that the current data show the expected patterns concerning sex differences.

Sex differences were controlled for in study-specific analyses, rather than analysed in their own right, due to the sex imbalance in participant samples (across programme of research, 77.20% of participants were female). However, for context, it is useful to briefly consider sex differences observed for whole-sample EI data obtained across the three studies, since there is very little 'norm' data available for older adolescents. In line with previous research, sex differences were detected for *AEI*, whereby females demonstrated higher levels of objective emotional skill. As determined by *t*-test, females (M = 10.16, SD = 2.47) outperformed males (M = 9.38, SD = 2.75) on emotion *management*, t = -2.23, p = .027. Similarly, females were better able to *perceive* emotions (M = 73.04, SD = .97) than males (M = 67.94, SD = 16.97), t = -2.32, p = .021. Findings corroborate previous evidence suggests that females typically score higher on all branches of AEI in adults (e.g., Cabello et al., 2016; Farelly & Austin, 2007; Fernández-Berrocal, Cabello, Castillo, & Extremera, 2012), and in children and young adolescents (Barlow, Qualter, & Stylianou, 2010; Qualter et al., 2012). That trend for females to be more emotionally proficient is also supported by meta-analytic research (Joseph & Newman, 2010; Sánchez-Núñez, Fernández-Berrocal, Montañés, & Latorre, 2008). By contrast, no discernible sex differences were detected for *TEI* at the global level. That finding is well-supported by previous adult (e.g., Brackett & Mayer, 2003), adolescent (e.g., Mavroveli et al., 2007; Mavroveli et al., 2008; Williams, Daley, Burnside, & Hammond-Rowley, 2009), and meta-analytic research (Joseph & Newman, 2010; Sánchez-Núñez et al., 2008). However, when the data were probed for sex-differences at the subscale level, factor level differences were found for 'self-control'. Males consistently perceived themselves as more competent in regulating their emotions and impulses (M = 4.52, SD = 9.48), than females did (M = 3.85, SD = .97), t = 5.05, p < .001). The trend of higher trait self-control scores in males has been identified previously (Siegling, Saklofske, Vesely, & Nordstokke, 2012). In sum, the sex differences in EI observed for the present research fully match those identified in the literature to date: females score more highly on AEI measures, whereas both sexes score equally on TEI measures (with the exception of the self-control subscale). Future studies should ensure a more balanced sample with respect to sex, so that the above sex-differences can be explored in the context of ER processes.

The above section highlights that in late adolescence (specifically in young people aged 16-18 years), assumptions regarding the conceptual frameworks of TEI (and to some extent, AEI) hold true. Thus, the research emphasises the need to control for the effects of allied variables, and sex differences, when judging the value of EI as a protective factor in adolescence. The next section considers whether EI predicts meaningful, incremental contributions to stress regulation processes in adolescents, beyond the effects of allied constructs, and what findings suggest about EI as a protective factor.

7.4 EI as a protective resource in adolescence

The research took a process-oriented approach, which aimed to broaden our understanding of how EI may moderate stress regulation processes in context (Davis, 2018b; Fiori, 2009). However, the rationale for the research emerged from the wealth of cross-sectional research identifying associations between EI and adaptive health outcomes (e.g., for review, see Martin et al., 2010). It is important to briefly consider whether the current set of findings validated those underlying assumptions. Broadly speaking, the research converged with prior literature and theory that suggests EI relates to better mental health and well-being, as measured through aspects of affect (Studies 1-3), clinical symptomology (Studies 1-2), and subjective well-being (SWB) (Study 3).

Based on correlation data across all studies, individuals with higher TEI consistently showed higher levels of baseline **PA** (r = .37, p < .001), and lower levels of **NA** (r = -.29, p = .001), indicative of the pattern shown for adult participants (Schutte et al., 2002; Sevdalis et al., 2007). Those scoring higher on the AEI measures showed lower levels of NA (emotion management $r = -.25$, $p < .001$; emotion perception $r = -.31$, $p < .001$) echoing findings found by others (e.g., Extremera & Rey, 2016). TEI (and all four subscales) also correlated strongly and significantly with indices of positive psychological **well-being**, in the case of happiness ($r = .70$, $p < .001$), and life satisfaction ($r = .63$, $p < .001$), supporting adult data (Austin et al., 2005; Chamorro-Premuzic et al., 2007; Petrides & Furnham, 2003; Livingstone & Day, 2005; Palmer et al., 2002). In addition, emotion management was associated with greater life satisfaction ($r = .16$, $p = .026$). However, findings are generally mixed with regards to AEI and SWB, with some studies returning either positive associations (e.g., Fernández-Berrocal & Extremera, 2016), or no relationship (e.g., Zeidner & Olnick-Shemesh, 2010). Nevertheless, the finding is still in line with the available evidence, which suggests a greater effect of EI abilities on *cognitive* well-being than on *affective* well-being (Fernández-Berrocal & Extremera, 2016). Turning to **mental health** symptomology, the literature consistently identified links between TEI and a lower risk of internalising problems in non-clinical adolescent populations (Fernandez-Berrocal et al., 2006; Schutte et al., 2007). That long-standing finding was corroborated by the present research, since whole-sample data showed that adolescents with higher TEI reported less anxiety ($r = -.57$, $p < .001$), and depression ($r = -.50$, $p < .001$). While AEI did not relate to anxiety or depression variables, this is not unusual (e.g., Martins et al., 2010), since the relationship between EI and health is generally much stronger when EI is measured as a trait. In sum, the findings observed for EI and mental health outcomes support those found for adults: emotionally intelligent adolescents tend to exhibit a more positive mood at baseline, and better mental health and well-being. This supports the argument for examining the processes underlying EI - the main focus of the research.

7.4.1 The incremental validity of EI

Throughout EI's history, there have been concerns that the associations between EI and adaptive outcomes simply reflect the overlap with personality traits (TEI: Zeidner et al., 2012b), or cognitive ability (AEI: MacCann et al., 2014). Indeed, the present research showed that empirically, those constructs are important to control for (especially the Big Five, which showed correlations with both TEI and AEI). Thus, to achieve rigour, and address those issues, all constructs that were deemed theoretically pertinent to the study outcomes (including personality and cognitive ability) were controlled for across the programme of research. Such analyses allow for a 'clean' assessment of EI's contributions to outcomes. Findings indicate that, depending on the context, both forms of EI *can* make a significant, incremental contribution to the prediction of acute stress regulation in adolescence (**Figure 18).** However, the *extent* to which EI predicted outcomes beyond personality, cognitive ability, and other emotion-related constructs, varied considerably between, and within, studies.

To illustrate the incremental validity of EI, it is necessary to consider analyses for which the role of EI reached statistical significance, especially for the finding that replicated: the TEI sociability subscale related to less stress reactivity across Studies 1 and 2. As expected, however, the factors that explained the most variance in both NA and HR reactivity were the experimental condition and pre-task state, which, together, explained 36-75% and 24-50% of the variance in NA reactivity and HR reactivity, respectively. In other words, how stressed a participant became during the experiment was mostly determined by how stressed they were at the beginning of the experimental session, and the type of task they were asked to complete. Adding in the covariates (e.g., sex, Big Five traits, cognitive ability, anxiety, depression) tended to explain a further 3-6% (NA), and 8-18% (HR). However, on top of that explained variance, the TEI subfactors, together with their conditional effects, explained between 2-6% of additional variance in NA reactivity, and 4-19% of HR reactivity. In line with reviews on the incremental validity of TEI, those results appear in line with other TEIQue analyses that have accounted for other construct-relevant criteria (e.g., 1-18% in adults, using the TEIQue-SF; Siegling et al., 2015b; 1.7-6.3% in adolescents, using the TEIQue-ASF; Siegling et al., 2017). However, findings challenge the concern that TEI's incremental effects are mainly attributed to predictor-criterion overlap in item content and method bias (Zeidner et al., 2012b), since TEI sociability related to HR (i.e., a criterion that does not overlap with TEI) *in addition* to NA reactivity. In contrast, the AEI abilities of emotion management and emotion perception did not significantly predict reactivity; additional explained variance in NA or HR reactivity was typically around 1%.

Notably, there were a number of analyses performed where neither TEI nor AEI predicted the study outcomes beyond confounds. For example, in the context of recovering from acute stress, only trait agreeableness (β = -1.22), and its interaction term (β = .83) remained significant at the final step of the analysis, indicating a link between agreeableness and NA recovery (i.e., adolescents' level of NA recovered more quickly after the stressor if they scored highly on agreeableness). However, another Big Five trait, neuroticism, predicted an attentional bias for orienting away from happy faces (β = -.57), whereas TEI and AEI failed to show significance. Out of the covariates examined for Study 3, it was *affect* that appeared pertinent for ER on social media. For instance, neither the Big Five traits, cognitive ability, nor EI, significantly predicted the likelihood of engagement with either positive or negative social media posts. However, with all other variables held constant, state PA (β = .03), and state NA (β = -.03) predicted likelihood of engagement with positive stimuli, indicating that an individual's decision of whether to engage with emotive social media posts might be influenced to a greater degree by state factors (i.e., their current mood), than by individual differences such as EI, personality, or cognitive ability. Furthermore, there were circumstances where EI *would* have likely been highlighted as a statistically significant predictor, had confounding influences *not* been accounted for. For example, both TEI and AEI initially correlated with affective responding in Study 3 (Chapter 6), but, unlike AEI, the significance of TEI was lost once confounding variables were entered into the hierarchical regression. In particular, the effects seem to have been largely attributable to baseline PA instead. In other words, because high TEI individuals tend to show greater levels of PA (Studies 1 and 2; also see Schutte, et al., 2002; Schutte & Malouff, 2011), and the phenomenon of mood-congruent processing of emotion (Rusting, 1998; Yiend, 2009), PA could therefore underly the relationship between TEI and affective reactivity to emotive stimuli. As discussed in Chapter 6, it may not be that having high TEI is detrimental or unhelpful on social media, but, rather, that AEI produces more of an incremental effect beyond allied constructs. The findings discussed above demonstrate the importance of controlling for relevant constructs, since not doing so may have yielded a number of false positive results, and, thus, 'overestimated' EI's contributions to study outcomes. In sum, when EI is 'stripped down' (i.e., isolated from the overlapping constructs within its nomological network), it still explains unique variance with respect to some, but not all, adolescent stress regulation processes.

7.4.2 EI and stress regulation: The role of context

As a whole, the programme of research explores the extent to which EI acts as a stress buffer in adolescence (i.e., is EI advantageous in stressful situations?), since this could be one way EI could lead to positive outcomes (e.g., Lea et al., 2019; Mikolajczak et al., 2009a). The findings obtained suggest that this view may be an oversimplification. Although there were no instances whereby EI strictly corresponded with *maladaptive* processing, there were cases where the effects of EI appeared to generalise across stressful and non-stressful contexts, but also ER processes for which EI showed specificity.

7.4.2.1 Specificity of EI's effects: generalised or stress-specific?

In stark contrast to the generalised effects of EI shown for the processes of attentional deployment and cognitive change, the effects of EI discriminated quite clearly between stressful and non-stressful situations with regard to stress *reactivity*. Specifically, TEI sociability was associated with less reactivity in the stress condition, but not the control condition. Furthermore, that effect replicated across two studies. Of all the findings, this one is most supportive of EI as a stress buffer in adolescence, and corroborates the pattern observed in adult samples (Mikolajczak et al., 2007; 2009). Furthermore, while EI showed *situation-specific* effects, the effect generalised across both physiological *and* psychological aspects of reactivity, suggesting that sociability may contribute to multiple aspects of the fight or flight response in social settings. As an amalgamation of several constructs, sociability comprises self-perceived traits relating to assertiveness, social competence, agreeableness, and self-efficacy (Petrides, 2009). With respect to that nomological network, *assertiveness* in social settings could be the key distinguishing aspect of sociability (p.187). Assertive individuals are self-efficacious, and have high self-esteem, meaning they can face stressful demands with confidence (Hughes, 2007; Krieger et al., 2015; Murphey et al., 2013), and perceive stressors as challenging rather than threatening (e.g., Trotman et al., 2018). The findings potentially signal that adolescents scoring highly on trait sociability handle psychosocial stressors better due to their assertiveness and confidence in social contexts.

EI did not unequivocally confer stress-dependent ER processing, however. For example, with respect to deliberate, controlled cognitive processes, AEI (EM) and TEI (self-control) predicted task-focussed coping, and post-event rumination, respectively. However, in both cases, effects were generalised across both stressful *and* control conditions, making it difficult to identify whether EI's relationship with those processes is especially helpful in challenging circumstances. With respect to coping specifically, AEI (EM) related to less reported use of task-focussed coping. Although identifying universal 'adaptive' strategies is not realistic, since the effectiveness of any one strategy is context-dependent (Baker & Berenbaum, 2007; Carver & Connor-Smith, 2010), Folkman & Moskowitz, 2004), active coping strategies (i.e., task-focussing coping) are more effective in *controllable* situations (e.g., Bowman & Stern, 1995). In the Sing-a-Song Stress Test (SSST) paradigm, the stress is instead largely *uncontrollable,* and the emphasis is on social evaluation, rather than evaluation of performance. Thus, rather than focussing on performance, keeping calm (e.g., by engaging with emotion-focussed coping strategies), is probably more helpful (Folkman & Moskowitz, 2004). However, the relationship between AEI (EM) and less task-focussed coping was also demonstrated for the control (reading) task, though the effect was weaker. As a non-stressful task, reading a magazine article (with no measure of performance or social evaluation), does not theoretically require high levels of task-focussed (i.e., there is no 'problem' to solve), emotion-focussed (i.e., the task is not designed to elicit an emotional response), or avoidant coping (i.e., the task is not unpleasant, reducing the need to 'escape'). Thus, while the effects of AEI did not discriminate *per se* (since effects applied to both experimental conditions), there appeared be a 'graded' effect, whereby emotionally intelligent adolescents used comparably less task-focussed coping for the most resource-intensive task, where other forms of coping were likely necessary. However, since AEI (EM) did not relate to levels of other coping strategies, that explanation is only speculative at present. If that prediction holds true, EI would theoretically relate to *higher* levels task-focussed coping if the stressor featured an element of performance evaluation (e.g., a grading of their singing skill), rather than solely social evaluation. Future research is necessary to test that hypothesis.

EI also showed a generalised effect with regards to post-event rumination, another cognitive ER strategy. Generally perceived as a *maladaptive* ER strategy, ruminating (which features intrusive, repetitive, unwanted thoughts that interrupt ongoing activities; Rachman, 1981) is typically detrimental to mental health and well-being (for meta-analysis, see Rood et al., 2009; Young & Dietrich, 2015). Evidence strongly suggests that there are not many circumstances where excessively ruminating after an event presents benefits for adolescents, and thus ruminating can result in both short-term (e.g., problem-solving; Ward, Lyubomirsky, Sousa, & Nolen-Hoeksema, 2003), and long-term issues (e.g., depressive symptoms; van Beveren, Kuppens, Hankin, & Braet, 2019). In the present research, TEI (self-control subscale) predicted lower levels of post-event rumination across both conditions, but with a slightly weaker effect for the reading task than the singing task. In other words, individuals that rated themselves as being able to control their emotions and impulses (Petrides, 2009), were less likely to brood after completing a task (whether the task was stressful or not). Having high TEI may help adolescents show less intrusive negative thoughts after *any* event, but the dampening of these is intensified further if that event was particularly stressful. The line of thought regarding a 'graded' effect of EI, suggested above with respect to problem-focussed coping, may also apply here. TEI may exert a slightly stronger effect on post-event rumination when the event was distressing, compared to a neutral event, because there are relatively more negative thoughts to suppress. Post-event rumination could therefore be a universal, adaptive ER strategy associated with TEI self-control. That subscale also demonstrated another generalised effect: attentional bias.

The effect of TEI (self-control) on attentional bias (where adolescents with high scores showed avoidance of sad faces) was *not* contingent on experimental group. Immediately following both the SSST and the reading task, adolescents with high self-control scores tended to orient *away* from sad faces. Theoretically, patterns of visual processing of high EI scorers *should* comprise of attentional bias away from threat in non-stressful conditions, but for threat in stressful conditions (Mogg & Bradley, 1998; Yiend, 2009). However, while angry faces were the primary focus (as anger is the most threatening emotion used in the study), it is unexpected that a significant outcome was only detected for sad faces, since sadness-inducing stimuli do not represent threat *per se*. However, as discussed in Chapter 5, evidence generally points to an avoidance of sadness-evoking stimuli is adaptive in everyday circumstances, and serves a protective function against depression (Mennen et al., 2019; Peckham et al., 2010). Because anxiety and depression were controlled for in the present study, one could speculate that findings indicate a way in which TEI could *safeguard* against future depression. Conflict exists in the growing number of studies assessing EI and attentional processing, providing little with which to contextualise the current findings. For example, Davis (2018b) identified roles for emotionality, well-being, and sociability TEI subscales, with effects *not* restricted to stressful conditions, whereas stress-specific effects *were* found for TEI self-control by Mikolajczak and colleagues

(2009b). Nonetheless, because the effect of EI was not stress-specific in the present research, it is not clear whether the generalised bias for orienting away from sad faces is helpful for adolescents in times of acute stress.

In summary, findings from the research challenge the previously held assumption that EI always provides benefit under stress, as there were cases where EI showed a generalised effect, but also cases where EI showed stress-specific effects. Generally, generalised effects of EI were present for coping and rumination (cognitive aspects of ER), and attentional processing, but evidence indicated clear-cut discriminatory effects with respect to EI and stress response modulation. In addition, as discussed under 'Incremental Validity of EI', there were also situations where EI explained no additional variance at all, despite theoretical predictions that it should (e.g., recovery from stress; attentional processing of happy faces), contradicting evidence that suggests EI (especially TEI) explains incremental variance in socioemotional outcomes in 81% of cases (Andrei et al., 2016). Overall, the effects of EI appeared very specific, and context-dependent.

7.4.2.2 The role of EI in controlled versus applied settings

In addition to the stress regulation process being examined, the *paradigm* used appears a key driver of whether EI shows significant effects. Specifically, the paradigm was an important in factor in determining whether *TEI* or *AEI* was the 'dominant' predictor of study outcomes. Broadly speaking, the research was conducted across two settings. The first was a tightly controlled experimental setting (Studies 1 and 2), and the second was an applied setting (Study 3), where ecologically valid stimuli were designed to represent social media content. At this point, it is important to emphasise that the way in which stress was operationalised differed significantly between the former paradigm, which induced acute psychosocial stress (using the SSST), and the latter, which exposed participants to highly emotive material (some of which was highly distressing). One way to conceptualise that distinction between the paradigms is that the former is classified as an *active* stressor (i.e., it requires active participation in a task), whereas exposure to emotive material is an example of a *passive* stressor (Hamilton & Alloy, 2016). While social media is often classified as an everyday 'stressor' in adolescence (Beyens et al., 2016; O'Reilly et al., 2018; van der Schuur et al., 2019; Weinstein & Selman, 2016), the paradigm employed in Study 3 did not technically induce acute stress (unlike the first two studies), since passively viewing emotive material is not necessarily stressful. Moreover, because Study 3 did not measure stress *per se*, it would not be valid to make direct comparisons between the paradigms. However, findings across both paradigms *do* provide indications of how EI contributes to ER processes 'in action', rather than relying on retrospective recollections of ER, or asking participants to self-report their typical patterns of responding.

A crucial finding with respect to response modulation was that TEI was most relevant in the controlled experimental setting, whereas AEI was most relevant in the more applied setting. Findings suggest that when in a socially evaluative situation, how confident adolescents feel about their emotional abilities matters more for stress regulation than their actual emotion-cognitive skill. In other words, socially charged, face-to-face situations require emotional self-efficacy to optimise stress outcomes. However, when confronted with stressful posts on social media (a poorly understood stressor), it is emotional cognition that enables an appropriate emotional response. Importantly, there were no findings that were common across both TEI and AEI conceptualisations of EI, not only corroborating the distinctiveness of two constructs, but also the notion that they operate through different trajectories with respect to adaptation (O'Connor & Little, 2003; Petrides & Furnham, 2000; Warwick & Nettelbeck, 2004). The following section discusses potential explanations for the context-dependent patterns observed with respect to each of the paradigms.

Present findings highlighted a key role for TEI sociability in the modulation of affective and physiological responses when acute psychosocial stress was induced under controlled conditions. The SSST has a strong social evaluation component, whereby participants are exposed to a potentially negative judgment by others (Campbell & Ehlert, 2012), achieved by having the participant sing in front of an experimenter, further exacerbated by the belief that the performance was being video-recorded. As a social stressor, the finding that sociability (i.e., self-perceptions related to emotional competence) is helpful, makes theoretical sense. Adolescents scoring highly on sociability view themselves as more assertive, and confident in their abilities to influence others' emotions (i.e., trait sociability) (Petrides, 2009), traits of which the broader stress literature highlights as strong predictors of adaptive functioning for young people in social contexts (Murphey et al., 2013). The precise mechanism of action that connects sociability to reactivity is still unknown, but there a likely a number of interconnecting processes involved, including, for example, cognitive appraisal, and locus of control (e.g., Mikolajczak et al., 2006; Mikolajczak & Luminet, 2008; Salovey et al., 2002). As suggested in the discussion sections of Chapter 4 and 5, it is possible that high sociability individuals perceive socially charged acute stressors as less threatening, and their prosocial nature and self-efficacy (i.e., trait sociability) enables them to instead focus on managing their emotional response (Meier et al., 2006; Mikolajczak et al., 2008). Or, perhaps, they felt more in control of the situation, since locus of control is a known protective factor in stressful situations (Jerusalem & Schwarzer, 1992; Roddenberry & Renk, 2010). Assertiveness, confidence, and other positive self-related perceptions seem the most useful emotion-related traits for becoming less stressed in situations where there is a seemingly high potential for negative judgement from others. Ultimately, in interpersonal contexts, actual abilities did not seem to be as useful as how adolescents perceived those abilities. However, while the study has yielded a role for EI as a stress buffer under controlled conditions, it is important to note that the current finding may not generalise to other types of stressor, even if those stressors are also 'active' and induced through experimentation. The precise emotions and physiological outcomes that emerge in a challenging situation are highly idiosyncratic, and hinge on many stressor characteristics (i.e., levels of social evaluative threat, cognitive effort required; Denson et al., 2009). It seems doubtful that sociability would be as valuable in *non*-social contexts (e.g., cognitive stressors), for example, or in the case of a passive stressor. The findings of Study 3 illustrate that point; in the case of a passive stressor, findings were markedly different to those where an active stressor was used.

Whilst several studies have tested whether EI relates to affective responses to exposure to emotive material (e.g., highly emotive videos, images, sounds, written statements) in experimental paradigms (Lea et al., 2019), no studies had yet examined whether findings differed when the material was presented using ecologically valid stimuli (i.e., social media). The previous 'offline' research typically demonstrates that TEI shows the capacity to exacerbate (e.g., Fernández-Berrocal & Extremera, 2006; Petrides & Furnham, 2003), but also decrease, the intensity of emotional reactions to emotive stimuli in adults (e.g., Ramos et al., 2007; Schutte et al., 2002; Zysberg, 2012). In two studies examining links between *AEI* and affective reactivity to emotional images, AEI had no effect on responses (Zysberg, 2012; Limonero et al., 2015). The present research does not support that TEI trend observed for 'traditional' passive mood induction studies; results signalled that, instead, *AEI* held the chief role in predicting affective responses to emotive stimuli. Adolescents skilled in emotion management and perception were more likely to report more intense emotional reactions to emotive material. Moreover, those effects were dependent on the valence of the post. Compared to less emotionally intelligent adolescents, they reported feeling stronger *positive* affect to the positive posts (e.g., smiling baby; cute puppy), and stronger *negative* affect to negative posts (e.g., KKK rally; injured dog). That pattern appears to represent context-sensitive responding (Blair et al., 1997; Goodwin et al., 2017; Livingstone & Srivastava, 2012; Seara-Cardoso et al., 2015; Tugade & Fredrickson, 2007). As proposed by emotion-as-information theory (sometimes also referred to as feelings-as-information theory, or affect-as-information theory), subjective experiences are an important source of information (Schwartz, 2012). According to that theory, exhibiting the appropriate emotional response (i.e., feeling the appropriate emotions in the appropriate situations) holds informational value for the task at hand, and assists with thought processes, such as decision-making (Storbeck & Clore, 2008). In other words, how we are feeling in a given situation helps us decide what actions we should take. Thus, showing appropriate reactions to material posted on social media could provide adolescents with useful information, which they could consequently use to navigate the emotionally complex material present online. Findings suggest that AEI could promote more efficient processing of salient emotional information, in line with contemporary frameworks regarding EI and emotion processing (Fiori & Veseley-Maillefer, 2018). Tentatively, one could suggest that this could comprise a way that AEI could help to safeguard well-being. However, it is worth noting that there still remains a significant proportion of variance in the observed effects *not* attributable to EI or the other variables measured, indicating that much work remains to be done in understanding individual differences in ER within social media contexts.

7.7.3 Implications of findings for adolescent resilience

Stress is a normal part of adolescent life, yet young people vary substantially in their vulnerability or resilience in the face of everyday adversity (Luthar et al., 2006; Wright et al., 2013). Given the considerable quantity of empirical evidence suggesting that emotionally intelligent individuals tend to be happier, healthier and more productive (Brackett et al., 2011; Petrides et al., 2016), and studies indicating that EI may hold a pivotal role in mediating or moderating the stress-illness relationship (e.g., Ciarrochi et al., 2002; Davis & Humphrey, 2014), the present research aimed to investigate the possible involvement of the construct in various stress regulation mechanisms, which could potentially underpin resilience processes in young people. Earlier discussion emphasised that resilience is not a static quality, trait, skill, or ability, but rather a dynamic interaction between risk factors and protective markers, that can buffer the effects of adversity (Luthar & Cushing, 2002). Within such a resilience framework, EI could be considered a protective marker *if* it helps individuals to moderate the impact of stressors (i.e., by acting as a stress buffer) (Masten et al., 1999; McMahon et al., 2003; Olsson et al., 2003). Findings from the programme of research are mixed, but tentatively hint at some implications for EI and resilience in older adolescents. For young people in the crucial developmental 'transition' period between adolescence and adulthood of 16-18 years, EI *does* appear advantageous, but only in certain circumstances. Whether EI buffers the effects of acute stress is dependent on several factors, including the specific ER process being examined (i.e., which 'family' of processes), how EI is measured (i.e., as a trait or an ability; AEI branch; whether TEI factors analysed separately), and the nature of the stress setting (i.e., acute psychosocial stress; exposure to emotive material).

Psychosocial stress is particularly potent in adolescent daily life, since adolescents are particularly sensitive to the effects of social evaluation (Gunnar et al., 2009; Somerville, 2013). The psychosocial task was selected to mimic everyday sources of social stress for young people (e.g., presentations; peer pressure; uncomfortable interactions with others; e.g., Rüppel et al., 2015; Zeidner & Matthews, 2005), through fear of failure, social evaluative threat, and a lack of control (Buck, 2016). When confronted with a stressor, individuals need to find a way to regulate their emotions, whilst also avoiding an exaggerated physiological response, to avoid placing an unnecessary 'wear and tear' on stress response systems of the body (e.g., Arora et al., 2010; Rano et al., 2018). Since TEI sociability corresponded with a dampened stress response, in terms of both affective and ANS reactivity, findings indicate that emotional self-efficacy might be a protective individual-level resource for adolescents in social settings. This could help explain why TEI is often associated with more positive stress-related outcomes in young people, such as better mental health and well-being (e.g., Austin et al., 2005; Chamorro-Premuzic et al., 2007; Fernandez-Berrocal et al., 2006; Schutte et al., 2007), and educational attainment (MacCann et al., 2020). In addition, AEI was associated with a reduced likelihood of using unhelpful coping strategies, but because this effect was generalised across stressful and non-stressful conditions (and thus did not moderate the impact of the stressor), the extent to which AEI exerts a protective effect with respect to adolescent resilience is unknown. However, AEI could bestow resilience in less *acutely* stressful situations where inter-personal social evaluation is not a prominent feature.

The propagation of social media use over the last decade is widely acknowledged, and the amount of time young people spend online has doubled in the past decade (Ofcom, 2017). In Great Britain, 96% of 16-24 year olds use social media (Office for National Statistics, 2017). For older adolescents, social media can present a pertinent, yet poorly understood, form of everyday stress that calls for further investigation (O'Reilly et al., 2018). Using social media posts as salient, ecologically valid emotive stimuli, the present research demonstrated that objective emotional skill may have a protective effect. Earlier discussion highlighted that adolescents adept at emotion management and perception showed emotional responses that aligned with those appropriate for the context (i.e., positive posts elicited strong positive emotions; negative posts elicited strong negative emotions, though the latter effect was not as strong). Mediation analyses suggest that this pattern of responding mediated the relationship between AEI and both the cognitive *and* affective components of SWB: life satisfaction (Diener et al., 1985), and happiness (Lyubomirsky & Lepper, 1999), demonstrating value of AEI for promoting hedonic well-being in adolescents (McMahan & Estes, 2011). Given that the effects were much stronger for positive social media posts, AEI may help emotionally intelligent adolescents to 'upregulate' positive emotions (joy, interest, contentment) (Frederickson, 1998), with positive posts acting as a 'mood-booster' amidst the large amount of distressing, violent, or otherwise threatening material on their social media newsfeeds (Best et al., 2014; Crone & Konijn, 2018; Weinstein, 2018). In addition, because AEI was associated with initially directing attention towards negative stimuli without impacting engagement with said stimuli, AEI might be helping to 'filter' out threatening material. Based on the current set of findings, AEI seems to link with a pattern of emotion information processing (EIP) that denotes adaptive responding on social media (potentially conferring resilience), though this area of research is in its embryonic stages.

With respect to EI in general, no single profile seems adaptive in isolation. Rather, the different skills and abilities required for successful stress regulation are dependent upon the environment, a sentiment echoed by other studies that have compared stress responding across different contexts (e.g., Shirtcliff, Peres, Dismukes, Lee, & Phan, 2014). In sum, findings provide mixed support for the notion of EI as a stress buffer in late adolescence. Furthermore, theoretically, the significant effects observed from the research as a whole *could* convey long-term benefits for both TEI (e.g., if sociability buffers acute stressful situations, this could prevent chronic stress and allostatic overload) and AEI (e.g., emotional skills could help adolescents form 'healthy' online behaviours and habits), but further investigation is required. While EI may help promote adaptive ER strategies in some stressful situations, the effect is neither consistent nor universal. The present research has demonstrated the presence of some context-dependent relationships between EI and key stress regulation processes, but exactly how those mechanisms are implicated within, and contribute towards, underlying risk-modifying mechanisms has yet to be elucidated, and should form a priority for future researchers.

7. 5 Measurement of EI in adolescence

7.5.1 Issues with adolescent EI measures

While the findings of the current research indicate that EI makes an important and incremental (albeit context-dependent) contribution to ER processes, they also hold implications for the measurement of both TEI and AEI in adolescence. The measurement of EI has been a thorny and controversial issue since its inception (e.g., Day, 2004; O'Connor et al., 2019; Petrides, 2011). The historic issue of whether TEI or AEI was 'better' is largely obsolete, since most EI researchers now agree that both are needed, and that each explains unique aspects of emotionally intelligent behaviour (Boyatzis, 2019). However, the more contemporary issue concerns how we can measure those constructs in a valid, reliable, and practical way. Moreover, few EI measures are designed for the later years of adolescence (16-18 years). Often described as a 'forgotten group' with respect to empirical research into emotional functioning (Kennedy, 2010; Zeman et al., 2007), that group would benefit greatly from the further development of age appropriate EI measures. Whilst the development of such measures is awaited, further testing of existing measures (especially AEI) is required to establish their psychometric properties with adolescent samples. Thus, although not a primary aim, the present research served to validate several EI measures within the 16-18-year-old population.

To support the efforts in addressing MSCEIT construct validity issues, a piecemeal approach is generally taken to AEI assessment (i.e., using different instruments to capture key aspects of AEI) (Elfenbein & MacCann, 2017; Fiori & Veseley-Maillefer, 2018). Choice of instrumentation was primarily based on the psychometric properties of existing adult measures (using reviews such as O'Connor et al., 2019), due to the dearth of readily available adolescent AEI measures suitable for the participant group in question. AEI measures used in the present research included the Situational Test of Emotional Management- Brief (STEM-B; Allen et al., 2015), and the Situational Test of Emotional Understanding- Brief (STEU-B; Allen et al., 2014), and a bespoke ERT. Reliability analyses conducted for the first empirical study (Chapter 4) highlighted the STEU-B (Allen et al., 2014) as a highly unreliable measure of emotional understanding for older adolescents. The study yielded an unacceptable level of internal consistency (α = .38) that was not attributable to any single item (Field, 2017). Others have encountered similar issues regarding the low internal reliability of the STEU in adult samples, though with values still higher than in the present study (α = .48; Austin et al., 2010; α = .40; Libbrecht, Lievens, Carette, & Cote, 2014; = .54; Martin-Raugh, Kell, & Motowidlo, 2016). It would seem that the STEU-B instrument does not adequately capture the construct of emotion understanding in late adolescence. In contrast, the instrument used to measure emotion *management* – the STEM-B (Allen et al., 2015) – appeared a more reliable measure than the STEU-B. In Studies 1, 2 and 3, α values calculated for the STEM-B were 67, .64, and .75, respectively. Moreover, those values concur with those found by studies using adult samples (e.g., α =.73; Austin, 2010; α = .84; Allen et al. 2015; α = .63: de Motta et al., 2018). The reasons for the disparity between the reliabilities of the STEU-B and STEM-B are unclear. Potentially, differences could have arisen though the two use different scoring methods (i.e., theory-based for the STEU; expert consensus for the STEM), but it is not obvious why theory-based scoring would negatively impact the reliability of a measure. One potential explanation for the discrepancy could be related to the developmental appropriateness of the STEU. A considerable portion of the scenarios contained within the STEU relate to workplace behaviour. While this makes the STEU highly applicable for professional contexts (O'Connor et al., 2019), only 20% of students aged 16-18 years work alongside their studies (UK Commission for Employment and Skills, 2015), which could impact adolescents' capacity to relate to the scenarios (and, consequently, underestimate their emotion understanding). Whilst such an explanation is only speculative, future researchers examining emotion understanding in older adolescents may wish to use the STEU-B with caution.

The STEM and STEU were included to capture the strategic branch of AEI, but there was difficulty in identifying a suitable tool to index the experiential branch. Within that latter branch, the present research did not measure the skill of ‘using emotion to facilitate thought’, which is frequently highlighted as conceptually redundant (e.g., Gardner & Qualter, 2011; Gignac, 2005; Joseph & Newman, 2010; Maul, 2011; Maul, 2012; Palmer et al., 2005; Rossen et al., 2008). However, while Studies 2 and 3 measured emotion perception, using a video-based emotion recognition test (ERT), as suggested by the literature (Elfenbein & MacCann, 2017), no suitable ERT could be sourced (as described in Chapter 4). For example, some ERTs only used static images, rather than multisensory integration (i.e., sight *and* sound), or posed technical issues upon uploading to an online platform (see **Appendix J**). Because a suitable test that satisfied all criteria could not be identified, a new ERT was developed for the purposes of the present study, using stimuli from the Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS; Livingstone & Russo, 2018). It is fairly commonplace for EI researchers to develop bespoke scales and tasks to fit the purposes of the study (e.g., see Zysberg et al., 2010). For the 255 participants in the research that completed the ERT, the mean accuracy rate was 71.97% (SD = 14.28), very similar to that reported for other ERTs (e.g., Multimodal Emotion Recognition Test [MERT]; Banziger et al., 2009; Geneva Emotion Recognition Test [GERT]; Schlegel & Scherer, 2015). Data also did not indicate any ceiling effects. Moreover, the pattern of accuracy across different emotion types was markedly similar to that recorded by others, whereby anger (75.26%) and happiness (73.63%) were the most accurately identified emotions, followed by sadness (70.64%), disgust (69.08%), surprise (67.77%), ending with fear as the least well-recognised emotion (66.41%) (Lydon & Nixon, 2014; Mancini, Biolcati, Agnoli, Andrei, & Trombini, 2018; Wells, Gillespie, & Rotshtein, 2016). Those whole-sample analyses thus suggest that the bespoke ERT was suitable for use as an assessment of emotion perception in adolescents, and that the subsequent findings regarding the role of emotion perception are not simply the artefact of a poorly designed measure.

Turning next to TEI, there are several well-validated measures of TEI available, but the TEIQue-ASF (Petrides, 2009) was selected for all studies due to its promising psychometric properties, and common usage (e.g., Davis & Humphrey, 2014; Ferrando et al., 2010; Mavroveli, et al., 2007; Siegling et al., 2015a; 2015b). When using global scores, the TEIQue-ASF (Petrides, 2009) appeared a reliable measure of TEI in older adolescents. Studies yielded Cronbach α values of .85- .91, all of which fall into the 'good' or 'excellent' range, suggesting that the TEIQue-ASF measured TEI consistently, and that all items sufficiently contributed to the global score (Tavakol & Dennick, 2011). However, exploratory analyses were also carried out, whereby the effects of the four subscale scores of the TEIQue were examined. Such analyses help to maximise the explanatory power of EI - and help to distinguish TEI from "a grab-bag of desirable personal characteristics" (Zeidner et al., 2006, p.102) – and to enable the differentiation of predictive and nonpredictive elements in different contexts (Downey et al., 2010; Zeidner et al., 2012b). As described earlier in the discussion, the programme of research identified a crucial role for TEI *sociability* with regards to modulating the stress response, whereby higher levels dampened psychological and physiological stress reactivity in the case of psychosocial stress. However, it was instead *self-control* that appeared more pertinent for attentional ER processes. Findings therefore support the notion that as an amalgamation of various emotional traits and dispositions that underlie emotionally intelligent behaviour (Petrides et al., 2007), global TEI is not helping us understand how adolescents navigate stressors. In other words, it is necessary to consider the role of EI's constituent parts alongside total scores.

Concerningly, the reliability of the subscales was lower than ideal in the case of emotionality (α = .66), sociability (α. = .59), and self-control (α = .62), though well-being sustained a ‘good’ level of internal consistency (α =.85). Whilst the present research returned slightly lower Cronbach alpha values than expected, the ‘pattern’ of reliability values across factors broadly corroborated that typically obtained from the TEIQue-SF, with sociability being one of the least reliable, and well-being one of the most reliable (e.g., Siegling et al., 2015b: emotionality: .72-.73, sociability: .72-.73, self-control: .67-.77, well-being: .86; Laborde, Allen, & Guillén, 2016: emotionality: .83, sociability: .70, self-control: .72, well-being: .78). Studies using the *adolescent* form of the TEIQue-SF tend not to provide reliability data for subscales (e.g., Davis & Humphrey, 2014; Ferrando et al., 2010; Mavroveli, et al., 2007), so it is difficult to judge whether the current reliability data is ‘typical’ for adolescent samples. Nonetheless, all four subscales were included in analyses, irrespective of reliability, since all items are necessary to construct the global score (Petrides, 2009). It is important to note, however, that the authors of the TEIQue suggest that results obtained from subscale analyses using its brief forms, should be interpreted with caution, since scales comprise only 6-8 items (Petrides, 2009). Reliability analyses conducted with subscales supports that notion. Often, the subscale responsible for significantly predicting a study outcome was the one of the most unreliable out of the four subscales for that study. For example, in study 2, global TEI did not predict any form of attentional bias, but self-control (α = .53) predicted bias away from sad faces. Whilst such findings hint that only parts of the TEI sampling domain (**Table 1**) may be pertinent to acute stress regulation in older adolescents, drawing firm conclusions regarding the role of the component subscales of TEI should be viewed as preliminary until similar findings are observed with the full-length version of the scale (TEIQue-AFF; Petrides, 2009).

An important caveat to the findings from the first two studies relates to a common critique of TEI measures: their susceptibility to faking and socially desirable responding (Day & Carroll, 2007), and their reliance on individuals being good judges of their emotion-related abilities (which they are largely not, e.g., Boyatzis, 2019; Brackett et al., 2006). Such behaviour can thus 'inflate' TEI's effects. The decision to try and mitigate the risk of socially desirable responding was made for Study 3, due to the study's reliance on self-reported measures. Indeed, that precaution appeared warranted, since TEI scores correlated significantly with socially desirable responding, in terms of both impression management (i.e., a conscious inclination to respond positively, to deceive others; r =.38, p < .001), and self-deceptive enhancement (i.e., an unconscious tendency to respond overly positively; r = .21, p < .001) (Paulhus, 1991). One could speculate that controlling for those variables may have somewhat dampened TEI's effects for that study. However, additional analyses (data not shown) indicated that the absence of TEI effects (at least in Study 3), was *not* due to accounting for socially desirable responding (i.e., when IM and SDE were not included as covariates, results were similar). In other words, response tendencies did not explain why TEI was unrelated to the indices representing emotion processing on social media. In sum, findings indicate that controlling for whereas socially desirable responding is still recommended in the case of EI studies where outcomes are primarily self-reported, it is not likely to have impacted the key findings from the programme of research.

Whilst not an EI instrument, the present research also provides empirical support for the SSST (Brouwer & Högervorst, 2014) as a practical and effective means of inducing acute stress in older adolescents. Few stressors are designed specifically for adolescent populations, but the SSST was selected based on a theoretical and pragmatic rationale (see **Appendix A**). Compared to the control group, participants in the stress condition (but not the control condition) exhibited a significant increase in HR, EDA, and NA from baseline, signalling that the SSST appears a reliable and potent stress inducer for adolescent participants. Data also helped validate other measures with participants aged 16-18 years, including instrumentation assessing transient mood (Positive and Negative Affect Schedule; Watson et al., 1988), personality (Mini International Personality Item Pool; Donnellan et al., 2006), mental health (Hospital Anxiety and Depression Scale; Zigmond & Snaith, 1983), and SWB (Subjective Happiness Scale; Lyubomirsky & Lepper, 1999; Satisfaction with Life Scale; Diener et al., 1985).

Overall, data discussed in this section suggest that viewing EI as a global construct does not tell us much about how it works. To understand the mechanisms underpinning EI, and how it leads to positive outcomes, coverage should be comprehensive (i.e., examine both TEI and AEI), and fine-grained (i.e., examine subscales of TEI, and branches of AEI). Further contributions towards the field of EI, present findings suggest that, for adolescents aged 16-18 years, the TEIQue-ASF, STEM-B (though not the STEU), and a video-based emotion recognition test, are appropriate for the respective measurement of TEI, emotion management, and emotion perception. Discussion now turns to another aspect of methodology pertinent to the current findings: effect sizes and replication.

7.5.1 Effect sizes and replication

Effect sizes across the present research were generally small, according to guidance for individual differences researchers suggesting *r* values of.10, .20, and .30 as relatively small, typical, and relatively large (Gignac & Szodorai, 2016). For statistically significant findings, the proportion of incremental variance explained by EI (i.e., change in R^2) ranged between 1 and 15%. For example, once confounding influences were controlled for, TEI sociability explained 4 - 5% of the variance in stress reactivity (Studies 1 and 2), and AEI emotion management explained 6% of the variance in affectivity to positive posts on social media (Study 3). The largest effect size emerged from study 2, whereby TEI self-control explained 15% of the variance in individuals' orientation away from sad faces. While small, the effect sizes yielded by the present research are not dissimilar to 'typical' effect sizes for EI. Recent meta-analyses often demonstrate small pooled effect sizes, with EI explaining 6% (TEI and affect, behaviour and cognition criteria; Andrei et al., 2016), 2 - 27% (TEI and biological variables; Sarrionandia & Mikolajczak, 2019), and 0.7 - 2.3% (EI and academic achievement; MacCann et al., 2020) of variance in criteria. Thus, small effect sizes for EI are not uncommon. Indeed, one recent perspective is that effect sizes in the EI field may be decreasing over time. A recent meta-meta-analysis (i.e., a meta-analysis of meta-analyses, covering 484 unique primary studies) observed a decline in effect sizes for TEI, but not AEI (Gong & Jiao, 2019). The authors suggest that their observed decline in TEI effect sizes could indicate that the TEI field may be experiencing a "replicability crisis" (Gong & Jiao, 2019), akin to the concerns applying to the field of psychology as a whole (Makel et al., 2012; Nelson et al., 2017). However, it seems plausible that the decline in effect sizes instead relates to changes in methodology.

The EI field has seen (slightly) greater uptake in more robust approaches, which has included, for example, accounting for confounding influences, a growing use of experimental paradigms, and increasing interest in examining EI's relationship with objective outcomes; (e.g., neurophysiological; physiological). With respect to the former, TEI studies are increasingly controlling for well-established confounds, namely personality and cognitive ability (e.g., di Fabio & Kenny, 2016; MacCann et al., 2020; Siegling et al., 2017), amongst other TEI-relevant constructs, such as optimism (Mikolajczak et al., 2006), and self-concept (Ferrando et al., 2010). After accounting for confounding influences, it would indeed follow that EI would explain less variance in outcomes, since the 'overlap' between EI and allied constructs would have previously been attributed to EI alone. For example, Study 1 demonstrated that TEI sociability and the Big Five trait agreeableness correlated significantly with each other, and both predicted less stress reactivity. Had agreeableness not been statistically controlled for, the effect size for TEI would have been falsely inflated. Another explanation for declining effect sizes in the EI field could relate to a change in the outcome measures being investigated. Whilst the quantity of 'behavioural' EI studies (often questionnaire-based) far outweighs those of a biological nature, neuropsychological and neurophysiological correlates of EI are of increasing interest in the attempt to link EI to health outcomes (for recent meta-analyses and reviews, see Sarrionandia & Mikolajczak, 2019; Raz & Zysberg, 2015). As alluded to in the earlier chapters, the issues of circularity, contamination, and socially desirable responding may be exaggerating the relationship between TEI and questionnaire-based outputs (Day & Carroll, 2007; Keefer et al., 2018).

For that reason, EI often relates more strongly to behavioural measures, than biological indices (Sarrionandia & Mikolajczak, 2019), including in the domain of stress reactivity (Lea et al., 2019). However, the present studies do not entirely support that observation, since significant findings were identified for both subjective and objective outcome measures, with approximately similar effect sizes across types of measure. It is not clear why this is the case, but could be a phenomena that features in adolescent sampling, for which little process-oriented research has been conducted with respect to EI. Although effect sizes are small in the present research, findings indicate that EI makes incremental contributions to aspects of affective, physiological, and cognitive stress regulation processes, to some extent, for both subjective and objectively measured criteria. From an optimistic standpoint, small effect sizes could be an artefact of rigorous methodology, whereas earlier studies may have inadvertently overestimated the power of EI to uniquely predict important criteria (Gong & Jiao, 2019). Thus, a decline in effect sizes should not be viewed as a 'failure' or a 'crisis', but could perhaps signal that advances are leading us towards better quality research, and a clearer picture of how EI contributes to life outcomes. Interestingly, the present research only partially supported the notion that TEI relates more strongly to outcomes than AEI does (Martins et al., 2010). In their recent meta-meta-analysis, Gong and Jiao (2019) found that average effect size of TEI (r = 0.27) was significantly higher than that of AEI (r = 0.16). The present study revealed that whether stronger effects were shown for TEI or AEI was dependent on the context (i.e., controlled or applied), and the outcome measure (i.e., objective or subjective; nature of the ER strategy).

A broader criticism of psychological research as a whole is that effects often fail to replicate (Maxwell, Lau, & Howard, 2015). Replications are markedly rare in the EI field, with the exception of authors that replicate studies within their own laboratory group, often released as multi-study papers (e.g., Cooper & Petrides, 2010; Gohm, 2003; Mikolajczak & Luminet, 2007; Mikolajczak et al., 2009a; 2009b). Nonetheless, replications are sorely needed to strengthen the credibility of the field. In response to this, the present research included elements of replication. For example, study 2 mirrored a high-quality experimental study that examined EI and attentional allocation in adults (Davis, 2019), to investigate whether findings extended to adolescents. Findings differed considerably between the studies, demonstrating the need for replication to highlight those nuances. Furthermore, study 2 constituted a replication of the stress induction paradigm employed in Study 1. Importantly, the key role of TEI sociability was consistent across the two studies, strengthening the credibility of that finding.

7.6 Contributions to knowledge

The programme of research makes significant contributions toward the existing body of knowledge within the EI field. The research is the first to examine how EI contributes to stress regulation processes in adolescents aged 16-18 years, an empirically neglected population. Whilst previous research has begun to explore such processes in young people (Ciarrochi et al., 2002; Davis & Humphrey, 2012a; 2014; Mikolajczak, et al., 2006), it was not known whether findings would also apply to older adolescents. Using Gross' (1998a; 1998b) model of ER as a framework, the research considered the influence of EI on several ER processes, including situation selection, attentional allocation, cognitive change. and response modulation. The overriding finding was that different aspects of EI contribute differentially to those processes. For example, only the sociability TEI subscale influenced stress response modulation. Since most findings were only applicable to either specific subscales of TEI, or specific branches of AEI, investigating EI exclusively as a global construct may not be useful.

Second, the research highlighted that in the quest to understand how EI works within stress trajectories, context matters. To reflect recommendations that the role of EI needs to be explored in different contexts, stress regulation processes were examined in both a controlled context (i.e., in a stress induction paradigm), and an applied context (i.e., on social media). Both approaches utilised different stressors (i.e., psychosocial stressor; exposure to emotive social media posts), and data collection environments (i.e., laboratory setting; online). Findings were strikingly different for those different contexts. When confronted with psychosocial stress under tightly controlled experimental conditions, aspects of *TEI* proved pertinent. In contrast, when exposed to highly emotive material on social media, *AEI* showed greater relevance. To date, the vast majority of EI studies have focussed on TEI, rather than AEI (for reviews, see Gutiérrez-Cobo et al., 2016; Lea et al., 2019; Resurrección et al., 2014). Findings from the programme of research suggest that both emotional self-efficacy (i.e., TEI) *and* emotion-cognitive skills (i.e., AEI) are beneficial for adolescents to some extent, but that different stress contexts 'activate' different aspects of each. Findings therefore indicate that the capacity of EI to buffer acute stress differs as a function of methodological and situational factors. As a result, future research should continue to measure the contributions of both constructs to ER processes.

Third, while findings should be considered preliminary, and should not be used to directly inform the content of SEL or EI training programmes, they challenge some of the assumptions upon which such programmes are based. As discussed in detail in Chapter 1, the current zeitgeist of cultivating protective factors to produce resilient young people through emotional education has resulted in a plethora of EI training programmes. However, as there is heterogeneity in school ethos, practices, and extent to which interventions incorporate EI content explicitly, the evidence base concerning their effectiveness is mixed. The core issue is that, while well-meaning, policies and school curricula have been keen to embrace EI training interventions, before knowledge of EI is underpinned by rigorous scientific investigation ("the cart before the horse") (Qualter et al., 2007). Furthermore, there is a potential risk that current programmes are not age-appropriate, as they are typically informed by data obtained from adult samples. The present programme of research has put forward evidence which indicates that, in older adolescents, the mechanisms underpinning EI are complex. Only certain *aspects* of EI seem important in acute stress regulation for adolescents, and these effects are entirely context-dependent. Most SEL and EI training programmes rely on intuitive, idiosyncratic, or overinclusive accounts of EI (Zeidner et al., 2012a), but the current data suggest that approach may not be effective in developing ER strategies, at least from a stress-buffering perspective. Findings suggest *potential* pathways through which EI *might* lead to well-being. For example, perceived social competence may assist with handling psychosocial stress, while emotion management skill could help facilitate context-sensitive emotional responses on social media. Moreover, in addition to understanding more about how EI might be beneficial, findings also emphasise the importance of boosting emotional knowledge *and* skills in addition to emotional self-efficacy. However, to date, SEL interventions are primarily evaluated using self-reported (i.e., questionnaire-based) changes, akin to TEI (e.g., psychosocial adjustment; Ruiz-Aranda et al., 2012b; reductions in aggression; Castillo-Gualda et al., 2017) rather than assessing changes in emotional skills explicitly (e.g., Durlak et al., 2011). This is something that should be addressed going forward.

7.7 Limitations

Whilst the research offers important contributions to knowledge, there are limitations that warrant consideration. Study-specific limitations were discussed in the respective chapters. For example, the STEU-B showed unacceptably low levels of reliability (Study 1), and the dot-probe paradigm may not have validly captured early attentional selection (Study 2). However, some limitations spanned multiple studies, including the ways in which ‘adaptive’ responding was ascertained, that causation cannot be inferred from the current set of findings, and issues of sample representativeness. The section below discusses those limitations.

The first limitation refers to the confidence with which the current findings imply adaptive behaviour. As noted by Matthews and colleagues (2002), “not only must we show that EI is associated with individual differences in processing, but those processing differences must have significant consequences for real-world functioning” (p. 233). Generally, findings were interpreted with respect to emotion theory to decipher whether the patterns observed for EI had implications for adolescent psychological adaptation. However, for all studies, it cannot be said with certainty whether EI corresponded with adaptive responding, since notable conflict exists within most aspects of the ER literature. The key study outcome for which such conflict exists relate to stress reactivity – a construct that describes the extent or capacity to which an individual responds to an acute stressor (Schlotz, 2013). While there is agreement that the network of systems that constitute the ‘fight or flight’ response is a core structure shared by all humans, there are large and enduring differences between people in terms of the magnitude of their stress response (Shirtcliff et al., 2014). Indeed, some individuals experience powerful affective and biological responses, whereas others experience show little change from baseline. There are persistent, heated debates about what constitutes optimal reactivity to stress, and whether heightened (i.e., hyperarousal) or blunted reactivity (i.e., hypoarousal) poses more of a threat to adaptation (see Hu et al., 2016; Phillips et al., 2013). The conventional view (and the approach taken by this thesis) proposes that repeatedly exaggerated elevations of stress markers (e.g., cortisol, cardiac activity), can, over time, lead to a number of physiological and psychological illnesses (e.g., Brown, Gallagher, & Creaven, 2017; Chida & Steptoe, 2010; Lovallo, 2011), due to “chronic wear and tear” on the stress systems of the body (McEwen, 2003; McEwen, 2004; McEwen, 2008). There is also evidence that suggests stress hyperreactivity can have harmful situational effects (e.g., decision-making; LeBlanc, 2009;

Arora et al., 2010; sport performance; van der Does et al., 2017; Rano et al., 2018; short-term memory; Kuhlmann et al., 2005; Shields et al., 2017). Hyperreactivity can also act as a *hallmark* of clinical conditions (e.g., depression; O'Hara, Armeli, Boynton, & Tennen, 2014), though some dispute this (Hamilton & Alloy, 2016). Studies that have examined stress responding developmentally, usually show that compared to adults, adolescents tend to show *heightened* reactivity to acute stressors, both physiologically and behaviourally (Romeo, 2013; Stroud et al., 2009). Combined, the protracted maturation of emotional neuroanatomy in adolescence, that hyperreactivity can create a "perfect storm" for some, resulting in an increased *risk* for internalising and externalising problems (Ortiz & Raine, 2004; Owens et al., 2018; Romeo, 2013).

Taking the above evidence base into account, the findings of the present research would indicate that EI (specifically the TEI sociability subscale) corresponds with adaptive stress modulation, since higher sociability predicted smaller HR and NA increases under stress. However, there is a (somewhat smaller, but growing) body of evidence indicating that *blunted* stress reactivity can also be harmful, whereby diminished responses to stressors may signal poor long-term health outcomes (for reviews, see Carroll et al., 2009; Lovallo, 2011; Phillips et al., 2013). For example, blunted relationships between loneliness and cortisol reactivity are sometimes observed (Brown et al., 2017), and experiencing early childhood adversity has been associated with blunted reactivity, leading to impulsive behaviour in young adulthood (Lovallo, 2013). Diminished reactivity has also been shown to predict negative health behaviours, such as disordered eating, and a greater likelihood of smoking (Ginty, Whittaker, Higgs, Heaney, & Carroll, 2011; Ginty, Jones, Caroll, Roseboom, Phillips, Painter, & de Rooij, 2014). In light of *those* (albeit, cross-sectional) findings, TEI sociability could be viewed as *detrimental* for adolescent stress responses. However, much of such evidence is conducted within clinical or subclinical groups (e.g., lonely individuals), in contrast to the participants that took part in the present research (i.e., a non-clinical group). In addition, mental health was controlled for (using the HADS) in the present research, meaning that smaller stress responses were unlikely to be attributable to mental health conditions. Furthermore, individuals still showed *some* reactivity (i.e., their responses were not completely blunted/diminished). Another perspective suggests that whether an individuals' stress response dynamics are beneficial (i.e., whether they should show hyper- or hyporeactivity) is dependent on the contexts, such as the stressor, the goals of the particular situation, and even the genetic profile of the individual (Ellis, Jackson, & Boyce, 2006; Lovallo, 2011; Turner et al., 2020). Until theory and evidence unequivocally elucidates the nature of 'healthy' stress responding for individuals, and upon which contextual factors this is contingent, the extent to which the findings from Studies 1 and 2 can be interpreted is limited. The 'threshold' for adaptive stress reactivity in late adolescence certainly warrants further investigation.

That limitation regarding the challenges in determining 'adaptive' responses also extends to Study 3. As considered in the discussion section for that study, it is difficult to judge whether the findings regarding AEI and responding to social media posts confers adaptivity. This is because the effectiveness of chosen ER strategies is tied to the social context, and the nature of the goal to be achieved, which can be interpersonal (e.g., to avoid conflict), hedonic (e.g., to feel better), or instrumental (e.g., getting work done) (English et al., 2016). Due to the uncontrolled nature of the data collection environment (akin to 'natural' social media use), there may be no 'rule' as to what entails an adaptive response to a social media post for a particular adolescent, at any one point in time, and the dearth of literature in that area means there is little context for the results to be interpreted within. Thus, while findings reinforce the context-dependent nature of EI's workings, it would be premature to suggest that EI promotes *adaptive* ways of processing and regulating emotional information.

A second shortcoming of the present programme of research is that causal relationships cannot be inferred, since the use of cross-sectional data restricts the scope of interpretations (Rutter, 2000). For example, high TEI (sociability) was associated with less stress reactivity in Studies 1 and 2. However, we cannot assume that sociability was solely responsible for that response pattern, in spite of the many variables that were controlled for in the regression analyses. There could still be an ability or disposition related to both reactivity and TEI that underlies that effect. For example, an adolescent's family context (e.g., trauma history, exposure to violence, conflict in the home), can influence both stress reactivity (Hamilton & Alloy, 2016), *and* emotional response styles (e.g., Heleniak, King, Monahan, & McLaughlin, 2017). Future work could take a more longitudinal approach, which is markedly absent for studies examining EI and stress, particularly in adolescence. One way to achieve this would be to measure adolescents' acute stress regulation both before and after an EI training intervention, whereby level of EI is manipulated. For example, subjective and physiological reactivity to the SSST (Study 1, Chapter 4) could be examined at baseline, and then again following an EI intervention. Changes in responding as a function of EI could then indicate a possible causal effect, and offer greater credence to the present set of findings. However, conducting such studies is hindered by the scope and effectiveness of currently implemented EI training interventions. As outlined in the introductory chapters, many SEL programmes (and subsequent evaluations) are not *specifically* designed to address EI, and the level of EI content in them is often insufficient (Matthews, Zeidner, & Roberts, 2002). Furthermore, very few interventions actually use EI measures at baseline or during post-study evaluations; most opt for outcomes considered to be influenced by increased EI, such as lower levels of depression and anxiety (Ruiz-Aranda et al., 2012), reductions in physical or verbal aggression (Castillo-Gualda et al., 2017), or teacher-ratings of prosocial behaviour (Humphrey et al., 2018). We therefore cannot be sure that such interventions successfully increase EI levels. Thus, it is not yet feasible to test whether stress regulation processes differ as a function of a change in EI levels. Comprehensive longitudinal studies charting the relationships between stress competencies and EI over time will be necessary to better understand the complexities of the stress-buffering relationship.

Third, it is not clear whether the participants recruited adequately represent the target population. Participants were all within the target age range (16-18 years), and were relatively equally distributed within that bracket, with 39.0 %, 32.7 %, and 28.3 % of participants aged 16, 17 and 18 years, respectively. However, of the 307 participants that took part in the current research, 77.2 % were female. While biological sex was controlled for in all analyses, such that sex would not have influenced the study outcomes, future studies could aim for a more equal split of males and females, and examine whether the effect of EI on acute stress responding is dependent on sex. Furthermore, the sample may not represent young people from all socioeconomic backgrounds. For Studies 1 and 2 (Chapters 4 and 5), participants were recruited primarily from sixth form colleges, in the West Midlands of the UK. However, it is important to note that not all young people aged 16-18 years are in full-time education. At the end of 2018, it was calculated that at least 24.6 % of young people aged 16-18 years in the UK were not in full or part-time education (Department for Education, 2019). This is pertinent because young people classified as 'NEET' (Not in Education, Employment, or Training) are especially vulnerable to developing mental health issues (Rodwell, Romaniuk, Nilsen, Carlin, Lee, & Patton, 2018). Additionally, young people whom are NEET have a higher probability of experiencing further adversities, such as living in residential care, becoming incarcerated, and engaging with substance or alcohol misuse, which together result in a cumulative risk for psychological dysfunction (Murphy & Fonagy, 2013; Powell, 2019). Importantly, it is precisely for those vulnerable groups that EI has been highlighted as being an especially important protective marker for mental health and well-being (Moreno-Manso, García-Baamonde, Guerrero-Barona, Godoy-Merino, Bázquez-Alonso, & González-Rico, 2015). EI may buffer the effects of stress differently, or work via different trajectories, in those vulnerable young people, whom may not be represented by the data acquired from the current research. In sum, the participant sample may not be representative of all adolescents aged 16-18, primarily due to issues concerning cultural and socioeconomic diversity. A worthwhile direction for future research could be to investigate whether adolescents from diverse backgrounds present different patterns of acute stress processing as a function of EI.

7.8 Future directions

There are several ways that the current research could be taken forward. There are ways in which the methods used could be adapted and refined, to help elucidate nuances in EI and ER and replicate current findings. However, future directions could also utilise alternative paradigms, to provide new perspectives on the notion of EI as a stress buffer in adolescence. Both ‘streams’ of potential future research will now be considered.

A clear way that the present research could be expanded is by exploring whether the current set of findings generalise. The research focussed on two different stressors: psychosocial stress, and the stress derived from emotive material on social media. A multitude of different stressors have been explored in relation to EI (Lea et al., 2019). These include exposure to stressful material (e.g., watching an excerpt from a holocaust documentary; Petrides & Furnham, 2003), cognitive stress (e.g., a mathematical puzzle; O'Connor et al., 2017), competitive sports events (e.g., running marathon; Lane & Wilson, 2011), or naturalistic stressors (e.g., a dental procedure; Aminabadi et al., 2013). The current research could be replicated in different stress contexts, to confirm external validity – or, alternatively (and more likely) – find that adolescents rely on different emotional traits and abilities in different situations. The importance of context in understanding emotional information processing has been noted by EI researchers previously; EI may relate to EIP and ER differently under different conditions (Veseley-Maillefer et al., 2018). In the case of the current research, for example, it could be that while sociability offers benefits in psychosocial contexts (as indicated by Studies 1 and 2), it may be redundant in situations where the stressor lacks an interpersonal element. One way to build on the foundation of Studies 1 and 2 could be to harness virtual reality (VR) technology, which has increasingly made its way into mainstream psychological research over the last two decades (Diemer, Alpers, Peperkorn, Shiban, & Mühlberger, 2015). VR presents a number of advantages afforded over traditional psychological experimentation, such as tighter control of the environment, and seemingly limitless possibilities for the creation of ecologically valid, salient stimuli. Evidence suggests that virtual environments are typically very effective in inducing social stress (Hartanto, Kampmann, Morina, Emmelkamp, Neerincx, & Brinkman, 2014; Zimmer, Buttlar, Halbeisen, Walther, & Domes, 2019). With the exception of one study, which explored how EI related to acute stress in medical students, using a VR surgery simulator (Arora et al., 2011), the EI field has yet to utilise VR in stress or emotion-inducing experiments. The relationship between EI and ER could be explored in situations that would be otherwise difficult to replicate in experimental settings, such as completing examinations with a large number of other people (which is a prominent cause of test anxiety in adolescents; Rüppel et al., 2015). This will be a valuable extension to the current findings. An alternative means of capturing EI and stress regulation 'in action' would be a daily diary approach, which could capture everyday stressors and the ER strategies (e.g., attention allocation; cognitive change; response modulation) used to tackle them. Such work is already underway in adults (e.g., Pekaar, Bakker, van der Linden, Born, & Sirén, 2018). However, to the best of the researcher's knowledge, this approach has not yet been implemented with reference to EI and everyday stress in adolescents. Using a daily diary approach could illuminate whether current findings generalise to actual, real-life stressors in adolescents' everyday lives.

As the first of its kind, Study 3 (Chapter 6), along with its findings, should be regarded as a preliminary, with the potential to stimulate further research in EI and ER on social media. Whilst socially desirable responding was controlled for via inclusion of the BIDR-16, it cannot be assumed that self-reported social media responding represents everyday social media behaviour. Often, individuals' self-reported social media activity does not reflect their actual activity. For example, one study demonstrated that social media users underestimate their smartphone usage by up to 40% (Lee, Ahn, Nguyen, Choi, & Kim, 2017). This is particularly relevant, considering all outcomes in the social media study were measured through self-report. Whilst not necessary a limitation of the research, a logical extension of the work would be to test whether results replicate when objective measures are deployed. For example, rather than asking participants how drawn they were towards a particular social media post, dwell time on different types of posts could be calculated through the monitoring of eye movements. Furthermore, engagement (i.e., situation selection; situation modification) with differently valenced posts could be quantified using behavioural data, such as whether the participant 'likes' a post, and calculating the duration of time a participant spends watching different video posts. Such approaches to measuring social media behaviour (e.g., gaze tracking, scrolling time, clicks) has traditionally been applied within the field of consumer psychology (e.g., Kim, Hassan, White, & Zitouni, 2014), but would be a promising means of taking the current research forward, and of providing credence to the current findings. In addition to replicating and extending the methods utilised in the present research, as outlined above, there are alternative paradigms that could form important empirical developments.

There would be much value in pursuing the role of emotional forecasting in the stress-buffering process with reference to EI. Emotional or affective forecasting represents the ability of an individual to predict their future feelings (Wilson & Gilbert, 2003). Preliminary work has begun to explore how EI feeds into those abilities. For example, Dunn et al. (2007) examined whether AEI (MSCEIT) or TEI (Self-Rated Emotional Intelligence Scale; SREIS) would be useful in helping participants predict how happy or sad they would feel in specific real-life situations (e.g., when they received their grades for coursework, 3 weeks later), with forecasting accuracy calculated as the absolute value of the difference between each participant's affective forecast, and their actual affective experience for each event. Out of the four AEI branches, emotion management emerged as the sole predictor of forecasting accuracy. A later study (Hoerger, Chapman, Epstein, & Duberstein, 2012) comprehensively examined affective forecasting with respect to exposure to emotionally evocative pictures, using measures of both TEI (SREIS, TEIQue-SF, Survey of Emotional Intelligence), and AEI (Judgement of Emotions Test; Interpersonal Judgement Inventory; STEU). Participants were asked how they would feel when exposed to specific pictures, to which they were provided a written description (e.g., “Police officers with nightsticks raised getting ready to beat a homeless man on the ground”). They were then exposed to the pictures one week later, and indicated their emotional responses. After controlling for cognitive functioning, three measures (TEIQue-SF well-being subscale, SREIS (Perceiving Emotions), and JET (global score) were associated with forecasting accuracy. Taken together, those studies indicate that EI helps with predicting one’s future emotional reactions.

The present research could provide a foundation for future investigations to build on that work in an adolescent sample. For example, the ability to forecast future affective reactions could be one way through which EI relates to EIP on social media. In one potential study, adolescents could predict their affective reactions to emotive videos on social media, given only still previews (combining methodologies of Study 3 and Hoerger et al., 2012), and then provide their true affective reactions upon watching the video some time later. Given the crucial role that AEI played in Study 3, it could be that such effects relate to the ability to forecast future emotional responses to emotive material. In other words, adolescents with high EI may be able to regulate emotions effectively on social media because they are better placed to predict the emotional impact of content, and modify their behaviour accordingly. Similarly, the principle of affective forecasting could be applied to acute stress induction (akin to Studies 1 and 2). Individuals with high EI may be better able to predict how acutely stressful they would find a socially evaluative situation.

7.9 Conclusion

The present research makes significant contributions toward the existing body of knowledge within the EI field. EI researchers are progressively investigating whether EI buffers the effects of acute stress for young people, and thus represents a protective marker within resilience frameworks (e.g., Ciarrochi et al., 2002; Davis & Humphrey, 2012a; 2012b; 2014; Mikolajczak, et al., 2006), but there remains a pressing need to conduct more process-oriented EI research (Peña-Sarrionandia et al., 2015). To address this, the present programme of work comprehensively investigated *how* and *when* EI contributes to stress regulation in late adolescence. While findings are mixed, EI makes unique contributions towards the prediction of stress regulation beyond the Big Five personality traits and cognitive ability. It would appear that whilst emotional self-efficacy (i.e., TEI) and emotional processing skills (i.e., AEI) *do* sometimes bestow protection for adolescents when faced with stressors, the mechanisms by which these operate differ substantially, with effects contingent on stressor context, and outcome measure. With respect to *how* EI moderates stress regulation, the research highlighted that EI emerged as a key predictor of ER processes within response trajectories (i.e., attentional deployment, cognitive change, response modulation; Gross, 1998a). However, EI's effects are often very specific, and hinge on methodological factors. In terms of *when* EI contributes to stress responding, aspects of *TEI* prove pertinent when adolescents are confronted with psychosocial stress under tightly controlled experimental conditions (i.e., an *active* stressor) whereas *AEI* shows greater relevance upon exposure to highly emotive material on social media (i.e., a *passive* stressor). While the vast majority of EI studies to date have focussed on TEI, rather than AEI (Gutiérrez-Cobo et al., 2016; Lea et al., 2019; Resurrección et al., 2014), this work provides clear support for the construct differentiation of trait and ability approaches to the study of EI, and suggests both have the potential to offer valuable insight into adaptational behaviours. Although causation cannot be inferred from the current set of findings, the research suggests potential ways that EI might be involved in the processing of acute stress, and represents a positive step forward in our pursuit to understand how EI might lead to positive life outcomes and confer resilience in young people.

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Appendix A

Justification for Study 1 Design

The sections below provide theory and evidence-based justifications for the specific design choices made in relation to the stress induction procedure, and the analysis of related outcomes.

Stress induction procedure

In a controlled experimental setting, stress can be induced in a multitude of ways (for reviews, see Gunnar et al., 2009; Zhang, Yu, & Barrett, 2014). The specific emotions and physiological outcomes that emerge in a challenging situation are highly idiosyncratic, and depend on many stressor characteristics (i.e., levels of social evaluative threat, cognitive effort required; Denson et al., 2009). However, to meet traditional theoretical definitions of 'stress' (Lazarus & Folkman, 1984), experimental stressors should be appraised as negative, unpredictable, and threatening, by the individual (Liu & Vickers, 2015).

As identified by systematic review (Lea et al., 2019), studies that have examined the relationship between EI and stress reactivity vary considerably in the protocols used to induce stress. While 34% opted for passive methods, whereby participants viewed, read, or listened to emotional stimuli (e.g., video clips, Ciarrochi et al., 2001), most studies (66%) used more active/participatory methods of stress induction. In those, participants performed tasks that were deemed stressful due to their difficulty, unfamiliarity, time pressure, and/or the presence of an audience participants (e.g., completing a timed Tower of Hanoi task; O'Connor et al., 2017; giving an impromptu speech; Ling et al., 2018). Compared to passive methods (e.g., viewing emotive stimuli), these 'motivated performance tasks' are generally deemed to be more ecologically valid methods of inducing stress (Fakhrhosseini & Jeon, 2017). In particular, psychosocial stressors – that induce stress through social evaluation – often demonstrate the largest effect sizes (Dickerson & Kemmy, 2004), especially in adolescent populations (Gunnar et al., 2009). Part of this could be because public speaking tasks are thought to successfully mimic examinations (a source of stress for many young people, e.g., Rüppel et al., 2015; Zeidner & Matthews, 2005), due to the similar feelings as those associated with testing process; including the fear of failure, social evaluative threat, and a lack of control (Buck, 2016).

The most widely used psychosocial stress protocol is the Trier Social Stress Test, which consists of a 10-minute waiting period, a 3-minute anticipatory period, a 5-minute public speaking task, and a 5-minute arithmetic test (TSST; Kirschbaum et al., 1993). The TSST is considered to be as the 'gold standard' for the induction of psychosocial stress protocols (Dickerson & Kemeny, 2004). However, the procedure is relatively complicated, and geared towards examining neuroendocrine responses, notably cortisol (Brouwer & Högervorst, 2014). In addition to its relatively long length, the TSST also requires a panel of judges dressed in white lab-coats, and a 'business-like, equipped test room', making it difficult to conduct in school-based settings. Furthermore, the TSST requires the participant to take on the role of a job applicant, which may not be the most relevant stressor for older adolescents (Buck, 2016).

The Sing-a-Song Stress Test (SSST; Brouwer & Högervorst, 2014) is a relatively new, novel, but effective, psychosocial stressor where participants are instructed to sing a song (for protocol details, see Chapter 4, p.110). Akin to the TSST, the SSST is also performed in front of an experimenter, which introduces the element of social-evaluative threat, further enhanced by the performance being video-recorded (purportedly for further analysis). While most adolescents may be seldom asked to sing in everyday life, evidence suggests that, in accordance to the stress-inducing potency of social evaluative threat, singing with an audience elicits considerable psychological stress (Harris, 2001; Hofmann, Moscovitch, & Kim, 2006). Importantly, while the magnitude of physiological stress achieved is comparable to that achieved by the TSST (Brouwer & Högervorst, 2014), the SSST is considerably shorter, and is much less resource-intensive. For example, recent evidence suggests that the SSST works equally well with a single experimenter (van der Mee, Duivestein, Gevonden, Westerink, & Geus, 2020). Furthermore, in contrast to the TSST and a number of other stress-inducing paradigms, body movements and sensory input are kept constant (i.e., the participant remains sitting down throughout), allowing physiological changes to be attributed exclusively to mental stress.

In sum, the SSST was selected as the stressor for the present study, as it significantly induces both physiological and perceived stress (Brouwer & Högervorst, 2014), and presents practical utility, and a greater suitability for the target participants, over other tests such as the TSST (Kirschbaum et al., 1993).

Measurement of stress reactivity and recovery

Since no ‘gold standard’ measure of response to stressful stimuli exists (Mauss & Robinson, 2009), the measurement of individuals’ responses to the SSST was given careful consideration. Because the stress pathway is complex, acute stress can be measured in a multitude of different ways. The full ‘fight or flight' response to stress involves arousal of both arousal the autonomic nervous system (ANS), and the somewhat faster HPA axis (e.g., McEwen, 2017). In the EI literature, commonly used physiological indices of stress reactivity include cardiac measures (including heart rate [HR], heart rate variability [HRV], blood pressure), cortisol secretion, electro-dermal activity (EDA), electroencephalography (EEG), and pupil dilation (Lea et al., 2019). HR was selected as an index for ANS reactivity in Study 1, due to its capacity to represent general ANS reactivity to acute psychosocial stress (Cohen, et al., 1995), and its rapid response to stress in comparison to other indices (e.g., cortisol), which can often can demonstrate a large time-delay before levels increase (Tarullo & Gunnar, 2006). HR can also be captured easily and non-invasively, making it an ideal choice for school-based studies.

While objective measurements are free from self-report biases, biomarkers are often not a reliable indicator of stress on their own, and should be applied together with self-report questionnaires to contextualize the measurements (Campbell & Ehlert, 2012). Though many studies focus only one aspect of the stress response (i.e., objective or subjective stress), the present study also captured psychological stress reactivity, as indicated by change in self-reported affect. In the majority of EI and stress reactivity studies identified by the systematic review (Lea et al., 2019), participants' acute psychological stress was conceptualized as the change in negative affect (NA) from baseline, for which the most popular tool was the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). To help with comparability between Study 1 and other published work, the NA scale of the PANAS was also used as a measure of psychological stress reactivity.

Analysis of stress reactivity and recovery

The study aimed to examine whether higher levels of EI predicted less stress reactivity under stressful conditions, when compared to a control group. To do this, hierarchical regressions were used, using the stress indices (HR; NA; described in the above section), as criterion. For this, EI was operationalised as a continuous variable, rather than being dichotomised through a median split approach. While others have used the latter approach (e.g., Davis, 2018b), avoiding artificial categorisation of psychological variables presents many benefits and often provides more meaningful interpretations of data (DeCoster, Gallucci, & Iselin, 2011). Treating EI as dichotomous could result in a loss of power, and increases in Type I errors (McClelland, Lynch, Irwin, Spiller, & Fitzsimons, 2015). Thus, the analytic strategy for the reactivity analyses was based upon that described by Matthews et al. (2006), where variables were added to the reactivity model in successive steps, including 1) baseline state, (2) task condition, (3) covariates, along with their product vectors representing conditional effects, (4) EI, as a continuous variable, and (5) product vectors representing EI x task condition. The use of a hierarchical approach also allows incremental effects of EI to be tested, which addresses a core limitation often observed in previous work: a lack of acknowledgement for the influence of confounding variables on the acute stress response.

Appendix B: Study Recruitment Materials

Recruitment Letter for Study 1

Dear [TITLE, LAST NAME]

I am a PhD student from the Institute of Health and Society at the University of Worcester with a passion and research interest in adolescent mental health. I am writing to offer your school the opportunity to take part in a doctoral research project entitled *'Emotions'* which is due to take place in the Worcestershire area. The aim of the project is to explore how young people (aged 16-18) use their emotional skills and abilities in different situations. Of particular interest is whether some of the ways young people recognise, understand, and use information about emotions (their own and others) are more effective than others. Knowing this could help us determine how best to help improve well-being and reduce the risk of developing mental health problems.

My aim is to recruit up to 50 young people from your school. The initial study is in two parts. The first part (an anonymous tick-box survey about emotions, personality, and mental health) can be completed online at the students' convenience. In the second part (which will take around 20 minutes), I will meet with students 1:1 and ask them to perform an unanticipated, mildly stressful task. Afterwards, I will ask students some questions about their coping strategies during the task. Delivery of all research would be entirely dependent on the convenience of the staff, young people and school timetable.

All of my research has been approved by the University of Worcester Humanities, Arts and Social Sciences Research Ethics Committee (HASSREC), and I have undergone an enhanced DBS check (copy available on request). I hope to start the research at the beginning of the **2017** academic year.

Taking part would reflect positively on your institution given the alignment of the research with the current educational agenda on building resilience, and social and emotional learning. This opportunity could also help students develop an understanding of the role and importance of research. Should your school participate in the study, I will be also be able to provide bespoke, aggregated feedback following collation of data from your students. This could be very useful in illuminating general mental health/well-being issues in the school, and identifying areas for potential intervention. Information on how school data compares with other participating schools could also be provided on request.

Thank you for taking the time to consider taking part in my research. I will follow this letter up with telephone call in around 10 days. In the meantime, if you are interested in discussing the project further, please do get in touch via email (r.lea@worc.ac.uk). I am happy to come into the school personally if you would like to have a face-to-face conversation at your convenience.

Yours sincerely,

Rose Lea
BSc (Hons) Biology, MSc Psychology
Institute of Health and Society, University of Worcester, Henwick Grove, Worcester WR2 6AJ

Appendix B: Study Recruitment Materials

Recruitment Letter for Study 2

Dear [TITLE, LAST NAME]

I am a psychology PhD student and Associate Lecturer from the University of Worcester, with a passion and research interest in adolescent mental health. I am writing to offer your school the opportunity to take part in a doctoral research project entitled *'Looking at Emotions* which is due to take place in the Worcestershire area.

The aim of the project is to explore how young people (aged 16-18) use their emotional skills and abilities (*emotional intelligence*) in different situations. Of particular interest is whether emotionally intelligent young people are more adept at handling stress, and, more specifically, whether they process visual emotional information (e.g. faces) in a healthier way under pressure. As you are likely well aware, mental health problems are becoming more prevalent in this age group. Improved understanding of the link between emotional intelligence and stress will help with development of more evidence-based preventative strategies, with the purpose of reducing the prevalence of mental health issues in adolescents.

My aim is to recruit up to 50 young people from your school. If possible, I would like to visit the school to introduce myself and speak directly with classes (this should take no longer than 10 minutes) to tell them about the study and invite them to take part. I feel this would be beneficial for Psychology students in particular as they would be able to learn about an example of psychology 'in action'. The study itself is in two parts. The first part (an anonymous tick-box survey that assesses emotional intelligence, personality, mental health, and includes a video-based emotion recognition task) can be completed online at the students' convenience, and will take around 25 minutes. In the second part (which will take around 45 minutes), I will meet with students 1:1 and ask them to perform an unanticipated (mildly stressful) task. Following the task, I will use a portable eye-tracker to monitor attention patterns (i.e., what the participant pays attention to). Delivery of all research would be entirely dependent on the convenience of the staff, young people, and school timetable.

All of my research has been approved by the University of Worcester Humanities, Arts and Social Sciences Research Ethics Committee (HASSREC), and I have undergone an enhanced DBS check (copy available on request). I hope to start the research at the beginning of the 2018 academic year.

Taking part would reflect positively on your institution given the alignment of the research with the current educational agenda on building resilience, and social and emotional learning. This opportunity could also help students develop an understanding of the role and importance of research. Feedback from my most recent research project at a local sixth form college was very positive - 100% of participants stated they would take part in research again. Should your school participate in the study, I will be also be able to provide a summary of the research findings following collation of data from your students.

Thank you for taking the time to consider taking part in my research. I will follow this letter up with telephone call in around 10 days. In the meantime, if you are interested in discussing the project further, please do get in touch via email (r.lea@worc.ac.uk). I am happy to come into the school personally if you would like to have a face-to-face conversation at your convenience.

Yours sincerely,

Rose Lea
BSc (Hons) Biology, MSc Psychology
Institute of Health and Society
University of Worcester, Henwick Grove, Worcester, WR2 6AJ

Appendix B: Study Recruitment Materials

Example of Recruitment Web Advert for Study 3

Title of the Study: Emotional intelligence and social media

Researchers (without academic titles): Rose Lea

Institution: University of Worcester

Web Address of Study: -weblink to study-

Brief Description of the Study:

This study is part of my PhD research. It is investigating how we use emotional intelligence on social media. It will take approximately 35-45 minutes to complete. There are 3 parts:

- In Part 1 - a video-based emotion recognition task.
- In Part 2 - 6 brief questionnaires about your personality, emotions and well-being.
- In Part 3 - an image-viewing task. This will involve viewing a newsfeed of posts, similar to a social media newsfeed. After this, you will be asked some short questions about how you felt about the posts that you have seen. Please note: for this part of the study, some of the content you will view can be considered offensive, such as violent pictures. If at any point you wish to stop the study, please close the browser window.

To take part in the study, you must be between the ages of 16 and 18 years old, and use a browser capable of playing videos with sound.

Ethics Review Information: Approved by the University of Worcester Ethics Committee, according to the University of Worcester Ethics Policy. Reference number: HCA17180065.

Appendix B: Study Recruitment Materials

Recruitment Email Template for Study 3

University of Worcester

Rose Lea
PhD Research Student and Associate Lecturer
Email: r.lea@worc.ac.uk
Phone: 01905 542328

Dear [TITLE, LAST NAME]

I am a PhD student and Associate Lecturer from the Institute of Health and Society at the University of Worcester, with a passion and research interest in adolescent mental health. I am writing to offer [NAME OF ORGANISATION] the opportunity to take part in a doctoral research project entitled *'Emotions and Social Media'*, an online study. The aim of the project is to explore how young people (aged 16-18) use their emotional skills and abilities on social media, and the impact of this on wellbeing. Understanding how different young people use social media can help with the development of age-appropriate interventions, thus reducing the risk of developing mental health problems.

About the Study

The study is completely online, and can be completed on a smartphone/laptop/tablet at the young person's convenience. The study itself is in three parts: 1) a video-based Emotion Recognition Task; 2) questionnaires about emotions, personality and wellbeing, and 3) an Image-Viewing Task, which mimics a social media newsfeed that contains emotional images. The study will take approximately 35-45 minutes, and can be stopped and resumed later.
All materials and questionnaires used in my study have been specifically selected and designed for use with 16-18 year olds. All responses will be anonymous and confidential. The research has been approved by the University of Worcester Humanities, Arts and Social Sciences Research Ethics Committee (HASSREC), and the study will be running until the end of July 2018.

I would greatly appreciate it if you could share the research invitation (attached to this email) with your [STUDENTS/YOUNG PEOPLE] involved with your organisation. I would also like to kindly request permission to put up posters in appropriate places around the [COLLEGE/CENTRE].

Thank you for taking the time to consider taking part in my research. If you have any questions, please feel free to contact me at: **r.lea@worc.ac.uk**.

Yours sincerely,

Rose Lea
BSc (Hons) Biology, MSc Psychology
Institute of Health and Society
University of Worcester
Henwick Grove
Worcester WR2 6AJ

Appendix B: Study Recruitment Materials

Recruitment Poster for Study 3

Research Invitation

Title of Project: Emotions and Social Media

The University of Worcester is carrying out a psychology research project looking at emotional intelligence, social media and wellbeing. We would like to invite you to take part.

Who can take part?

You are invited to take part if you are 16-18 years old.

Do I have to take part?

No. If you are interested in psychology or research, you may find the experience useful, but it is up to you whether you want to take part. You can withdraw at any time. Your responses will be anonymous and confidential.

What is involved if I agree to take part?

There are three parts (all are online) and will take 35-45 minutes in total. The study can be completed on a laptop/phone/tablet at your own pace:

Part 1. A video-based emotion recognition task (audio required).

Part 2. Some brief questionnaires about your personality, emotions and wellbeing.

Part 3. An image viewing task: you will be asked to look at images as if you are scrolling through a social media newsfeed. Afterwards, you will be asked how the posts made you feel.

To take part, or for more information, scan the QR code or use this link:

https://www.qualtrics.com/12345

Questions? Contact Rose on r.lea@worc.ac.uk

Appendix C: Measures

Trait Emotional Intelligence Questionnaire – Adolescent Short Form (Petrides, 2009)

Instructions: Please answer by ticking the number that best shows how much you agree or disagree with each sentence below. If you strongly disagree with a sentence, tick a number close to 1. If you strongly agree with a sentence, tick a number close to 7. If you're not too sure if you agree or disagree, tick a number close to 4. Work quickly, but carefully. There are no right or wrong answers.

		Disagree						**Agree**
		1	**2**	**3**	**4**	**5**	**6**	**7**
1	It's easy for me to talk about my feelings to other people							
2	I often find it hard to see things from someone else's point of view							
3	I'm a very motivated person							
4	I find it hard to control my feelings							
5	My life is not enjoyable							
6	I'm good at getting along with my classmates							
7	I change my mind often							
8	I find it hard to know exactly what emotion I'm feeling							
9	I'm comfortable with the way I look							
10	I find it hard to stand up for my rights							
11	I can make other people feel better when I want to							
12	Sometimes, I think my whole life is going to be miserable							
13	Sometimes, others complain I treat them badly							
14	I find it hard to cope when things change in my life							
15	I'm able to deal with stress							
16	I don't know how to show the people close to me that I care about them							
17	I'm able to "get into someone's shoes" and feel their emotions							
18	I find it hard to keep myself motivated							
19	I can control my anger when I want to							
20	I'm happy with my life							
21	I would describe myself as a good negotiator							
22	Sometimes, I get involved in things I later wish I could get out of							
23	I pay a lot of attention to my feelings							
24	I feel good about myself							
25	I tend to "back down" even if I know I'm right							
26	I'm unable to change the way other people feel							
27	I believe that things will work out find in my life							

28	Sometimes, I wish I had a better relationship with my parents							
29	I’m able to cope well in new environments							
30	I try to control my thoughts and not worry too much about things							

Appendix C: Measures

Situational Test of Emotional Management – Brief (Allen et al., 2015)

Instructions: The following questions each describe an emotional situation, and ask you to choose the most effective course of action (from a possible 4) to manage the emotions the person is feeling and the problems they face in that situation. Although more than one course of action may be acceptable, you are choosing what you think is the most effective response. Remember, you are not necessarily choosing what you would do, or the nicest thing to do, but the most effective response for that situation.

1. Wai-Hin and Connie have shared an office for years but Wai-Hin gets a new job and Connie loses contact with her. *What action would be the most effective for Connie?*
   (a) Just accept that she is gone and the friendship is over.
   (b) Ring Wai-Hin an ask her out for lunch or coffee to catch up.
   (c) Contact Wai-Hin and arrange to catch up but also make friends with her replacement.
   (d) Spend time getting to know the other people in the office, and strike up new friendships.

2. Manuel is only a few years from retirement when he finds out his position will no longer exist, although he will still have a job with a less prestigious role. *What action would be the most effective for Manual?*
   (a) Carefully consider his options and discuss it with his family.
   (b) Talk to his boss or the management about it.
   (c) Accept the situation, but still feel bitter about it.
   (d) Walk out of that job.

3. Surbhi starts a new job where he doesn't know anyone and finds that no one is particularly friendly. *What action would be the most effective for Surbhi?*
   (a) Have fun with his friends outside of work hours.
   (b) Concentrate on doing his work well at the new job.
   (c) Make an effort to talk to people and be friendly himself.
   (d) Leave the job and find one with a better environment.

4. Andre moves away from the city his friends and family are in. He finds his friends make less effort to keep in contact than he thought they would. *What action would be the most effective for Andre?*
   (a) Try to adjust to life in the new city by joining clubs and activities there.
   (b) He should make the effort to contact them, but also try to meet people in his new city.
   (c) Let go of his old friends, who have shown themselves to be unreliable.
   (d) Tell his friends he is disappointed in them for not contacting him.

5. Clayton has been overseas for a long time and returns to visit his family. So much has changed that Clayton feels left out. *What action would be the most effective for Clayton?*
   (a) Nothing – it will sort itself out soon enough.
   (b) Tell his family he feels left out.
   (c) Spend time listening and getting involved again.
   (d) Reflect that relationships can change with time.

6. Daniel has been accepted for a prestigious position in a different country from his family, who he is close to.

He and his wife decide it is worth relocating. *What action would be the most effective for Daniel?*

(a) Realize he shouldn't have applied for the job if he didn't want to leave.

(b) Set up a system for staying in touch, like weekly phone calls or emails.

(c) Think about the great opportunities this change offers.

(d) Don't take the position.

7. Mei Ling answers the phone and hears that close relatives are in hospital critically ill. *What action would be the most effective for Mei Ling?*

(a) Let herself cry and express emotion for as long as she feels like.

(b) Speak to other family to calm herself and find out what is happening, then visit the hospital.

(c) There is nothing she can do.

(d) Visit the hospital and ask staff about their condition.

8. Shona has not spoken to her nephew for months, whereas when he was younger they were very close. She rings him but he can only talk for five minutes. *What action would be the most effective for Shona?*

(a) Realize that he is growing up and might not want to spend so much time with his family any more.

(b) Make plans to drop by and visit him in person and have a good chat.

(c) Understand that relationships change, but keep calling him from time to time.

(d) Be upset about it, but realize there is nothing she can do.

9. Mina and her sister-in-law normally get along quite well, and the sister-in-law regularly baby-sits for her for a small fee. Lately she has also been cleaning away cobwebs, commenting on the mess, which Mina finds insulting. *What action would be the most effective for Mina?*

(a) Tell her sister-in-law these comments upset her.

(b) Get a new babysitter.

(c) Be grateful her house is being cleaned for free.

(d) Tell her only to baby-sit, not to clean.

10. Juno is fairly sure his company is going down and his job is under threat. It is a large company and nothing official has been said. *What action would be the most effective for Juno?*

(a) Find out what is happening and discuss his concerns with his family.

(b) Try to keep the company afloat by working harder.

(c) Start applying for other jobs.

(d) Think of these events as an opportunity for a new start.

11. Mallory moves from a small company to a very large one, where there is little personal contact, which she misses. *What action would be the most effective for Mallory?*

(a) Talk to her workmates, try to create social contacts and make friends.

(b) Start looking for a new job so she can leave that environment.

(c) Just give it time, and things will be okay.

(d) Concentrate on her outside-work friends and colleagues from previous jobs.

12. A demanding client takes up a lot of Jill's time and then asks to speak to Jill's boss about her performance. Although Jill's boss assures her that her performance is fine, Jill feels upset. *What action would be the most effective for Jill?*

(a) Talk to her friends or workmates about it.

(b) Ignore the incident and move on to her next task.

(c) Calm down by taking deep breaths or going for a short walk.

(d) Think that she has been successful in the past and this client being difficult is not her fault.

13. Blair and Flynn usually go to a cafe after the working week and chat about what’s going on in the company. After Blair’s job is moved to a different section in the company, he stops coming to the cafe. Flynn misses these Friday talks. *What action would be the most effective for Flynn?*

(a) Go to the cafe or socialize with other workers.
(b) Don’t worry about it, ignore the changes and let Blair be.
(c) Not talk to Blair again.
(d) Invite Blair again, maybe rescheduling for another time.

14. Michelle’s friend Dara is moving overseas to live with her partner. They have been good friends for many years and Dara is unlikely to come back. *What action would be the most effective for Michelle?*

(a) Forget about Dara.
(b) Spend time with other friends, keeping herself busy.
(c) Think that Dara and her partner will return soon.
(d) Make sure she keeps in contact through email, phone or letter writing.

15. Hannah’s access to essential resources has been delayed and her work is way behind schedule. Her progress report makes no mention of the lack of resources. *What action would be the most effective for Hannah?*

(a) Explain the lack of resources to her boss or to management.
(b) Learn that she should plan ahead for next time.
(c) Document the lack of resources in her progress report.
(d) Don’t worry about it.

16. Reece’s friend points out that her young children seem to be developing more quickly than Reece's. Reece sees that this is true. *What action would be the most effective for Reece?*

(a) Talk the issue over with another friend.
(b) Angrily confront her friend about making such statements.
(c) Realize that children develop at different rates.
(d) Talk to a doctor about what the normal rates of development are.

17. Jumah has been working at a new job part-time while he studies. His shift times for the week are changed at the last minute, without consulting him. *What action would be the most effective for Jumah?*

(a) Refuse to work the new shifts.
(b) Find out if there is some reasonable explanation for the shift changes.
(c) Tell the manager in charge of shifts that he is not happy about it.
(d) Grumpily accept the changes and do the shifts.

18. Julie hasn’t seen Ka for ages and looks forward to their weekend trip away. However, Ka has changed a lot and Julie finds that she is no longer an interesting companion. *What action would be the most effective for Julie?*

(a) Cancel the trip and go home.
(b) Realize that it is time to give up the friendship and move on.
(c) Understand that people change, so move on, but remember the good times.
(d) Concentrate on her other, more rewarding friendships.

Appendix C: Measures

Situational Test of Emotional Understanding – Brief (Allen et al., 2014)

Instructions: The following questions each describe a situation, and ask you to choose which of five emotions is most likely to result from that situation.

Example: Clara receives a gift. Clara is most likely to feel? (a) Happy (b) Angry (c) Frightened (d) Bored (e) Hungry. If you think Clara would feel happy, you would tick the box for 'Happy' and then move onto the next question.

1. Xavier completes a difficult task on time and under budget. *Xavier is most likely to feel?*
    (a) Surprise
    (b) Pride
    (c) Relief
    (d) Hope
    (e) Joy

2. If the current situation continues, Denise's employer will probably be able to move her job to a location much closer to her home, which she really wants. *Denise is most likely to feel?*
    (a) Distress
    (b) Joy
    (c) Surprise
    (d) Hope
    (e) Fear

3. Song finds out that a friend of hers has borrowed money from others to pay urgent bills, but has in fact used the money for less serious purposes. *Song is most likely to feel?*
    (a) Anger
    (b) Excitement
    (c) Contempt
    (d) Shame
    (e) Horror

4. Charles is meeting a friend to see a movie. The friend is very late and they are not in time to make it to the movie. *Charles is most likely to feel?*
    (a) Depressed
    (b) Frustrated
    (c) Angry
    (d) Contemptuous
    (e) Distressed

5. Someone believes that another person harmed them on purpose. There is not a lot that can be done to make things better. *The person involved is most likely to feel?*
    (a) Dislike
    (b) Rage

(c) Jealousy
(d) Surprise
(e) Anxiety

6. Jim enjoys spending Saturdays playing with his children in the park. This year they have sporting activities on Saturdays and cannot go to the park with him any more. *Jim is most likely to feel?*

(a) Angry
(b) Sad
(c) Frustrated
(d) Distressed
(e) Ashamed

7. Megan is looking to buy a house. Something happened and she felt regret. *What is most likely to have happened?*

(a) She didn't make an offer on a house she wanted, and now she is trying to find out if it is too late.
(b) She found a house she liked that she didn't think she would find.
(c) She couldn't make an offer on a house she liked because the bank didn't get her the money in time.
(d) She didn't make an offer on a house she liked and now someone else has bought it.
(e) She made an offer on a house and is waiting to see if it is accepted.

8. Mary was working at her desk. Something happened that caused her to feel surprised. *What is most likely to have happened?*

(a) Her work-mate told a silly joke.
(b) She was working on a new task she hadn't dealt with before.
(c) She found some results that were different from what she thought they would be.
(d) She realized she would not be able to complete her work.
(e) She had to do a task she didn't normally do at work.

9. Someone thinks that another person has deliberately caused something good to happen to them. *They are most likely to feel?*

(a) Hope
(b) Pride
(c) Gratitude
(d) Surprise
(e) Relief

10. By their own actions, a person reaches a goal they wanted to reach. *The person is most likely to feel?*

(a) Joy
(b) Hope
(c) Relief
(d) Pride
(e) Surprise

11. An unwanted situation becomes less likely or stops altogether. *The person involved is most likely to feel?*

(a) Regret
(b) Hope
(c) Joy
(d) Sadness

(e) Relief

12. Hasad tries to use his new mobile phone. He has always been able to work out how to use different appliances, but he cannot get the phone to function. *Hasad is most likely to feel?*

(a) Distressed
(b) Confused
(c) Surprised
(d) Relieved
(e) Frustrated

13. Dorian's friend is ill and coughs all over him without bothering to turn away or cover his mouth. *Dorian is most likely to feel?*

(a) Anxiety
(b) Dislike
(c) Surprise
(d) Jealousy
(e) Rage

14. Quan and his wife are talking about what happened to them that day. Something happened that caused Quan to feel surprised. *What is most likely to have happened?*

(a) His wife talked a lot, which did not usually happen.
(b) His wife talked about things that were different to what they usually discussed.
(c) His wife told him that she might have some bad news.
(d) His wife told Quan some news that was not what he thought it would be.
(e) His wife told a funny story.

15. A supervisor who is unpleasant to work for leaves Alfonso's work. *Alfonso is most likely to feel?*

(a) Joy
(b) Hope
(c) Regret
(d) Relief
(e) Sadness

16. The nature of Sara's job changes due to unpredictable factors and she no longer gets to do the portions of her work that she most enjoyed. *Sara is most likely to feel?*

(a) Ashamed
(b) Sad
(c) Angry
(d) Distressed
(e) Frustrated

17. Leila has been unable to sleep well lately and there are no changes in her life that might indicate why. *Leila is most likely to feel?*

(a) Angry
(b) Scared
(c) Sad
(d) Distressed
(e) Guilty

18. Someone believes another person has deliberately caused something good to stop happening to them. However, they feel they can do something about it. *They are most likely to feel?*

(a) Angry
(b) Contemptuous
(c) Distress
(d) Depressed
(e) Frustrated

19. Matthew has been at his current job for six months. Something happened that caused him to feel regret. *What is most likely to have happened?*

(a) He did not apply for a position he wanted, and has found out that someone else less qualified got the job.
(b) He did not apply for a position he wanted, and has started looking for a similar position.
(c) He found out that opportunities for promotion have dried up.
(d) He found out that he didn't get a position he thought he would get.
(e) He didn't hear about a position he could have applied for and now it is too late.

Appendix C: Measures

Mini International Personality Item Pool (Donnallan et al., 2006)

Instructions: This section contains 20 phrases that describe various behaviours. Please use the rating scale to show how accurately each statement describes you. Be honest, and describe yourself as you generally are now, not as you wish to be in the future. Work quickly, but carefully. There are no right or wrong answers. How accurately do the following statements describe you? “I…”

	Very inaccurate	Moderately inaccurate	Neither accurate or inaccurate	Moderately accurate	Very accurate
Am the life of the party					
Rarely feel blue					
Make a mess of things					
Have a vivid imagination					
Don’t talk a lot					
Have difficulty understanding abstract ideas					
Am not interested in abstract ideas					
Talk to a lot of different people at parties					
Feel others’ emotions					
Do not have a good imagination					
Get chores done right away					
Am relaxed most of the time					
Sympathise with others’ feelings					
Have frequent mood swings					
Get upset easily					
Am not interested in other people’s problems					
Keep in the background					
Often forget to put things back in their proper pace					
Like order					
Am not really interested in others					

Appendix C: Measures

Vocabulary test from the Kit of Factor-Referenced Cognitive Tests (Ekstrom et al., 1976)

Instructions: This is a test of your knowledge of word meanings. One of the four words in the drop-down list has the same, or nearly the same, meaning as the word above. Indicate which word you think is closest in meaning.

Example: Attempt. a) Run b) Hate c) Try d) Stop. Try is the most similar in meaning to attempt.

Airtight	Firm	Light	**Sealed**	Plane sick
Peddle	Tattle	Cheat	Misrepresent	**Sell**
Raider	Frontiersman	**Plunderer**	Murderer	Cynic
Energetically	Inspiringly	Skillfully	Delightfully	**Vigorously**
Implicate	**Involve**	Remove	Retaliate	Exaggerate
Gloaming	Autumn	Midnight	**Twilight**	Daybreak
Legibleness	Crookedness	Amity	**Plainness**	Carelessness
Laceration	**Cut**	Oration	Tumour	Flogging
Jollification	Capitulation	**Merrymaking**	Emancipation	Teasing
Willowy	**Lithe**	Windy	Quiet	Fickle
Feline	Guileness	Fabulous	Equine	**Catlike**
Dispiritedly	Neglectfully	Conspicuously	Dishonourably	**Dejectedly**
Intricacy	Delicacy	**Complexity**	Invisibility	Hostility
Excerpt	Accept	**Extract**	Curtail	Deprive
Arrogance	Contrariness	Insubordination	**Haughtiness**	Vivacity
Gallivant	Serenade	**Gad about**	Plunder	Espouse
Sheik	Priest	Casque	Shepherd	**Chief**
Exorbitance	**Excessiveness**	Dissidence	Unamity	Gaiety

Appendix C: Measures

Hospital and Anxiety Depression Scale (Zigmond & Snaith, 1983)

Instructions: For each question, select the option that is closest to how you have been feeling in the past week. Don't take too long over your replies: your immediate is best.

	D	A		D	A
I feel tense or 'wound up':			**I feel as if I am slowed down**		
Most of the time		3	Nearly all the time	3	
A lot of the time		2	Very often	2	
From time to time, occasionally		1	Sometimes	1	
Not at all		0	Not at all	0	
I still enjoy the things I used to enjoy:			**I get a sort of frightened feeling like 'butterflies' in the stomach:**		
Definitely as much	0		Not at all		0
Not quite so much	1		Occasionally		1
Only a little	2		Quite often		2
Hardly at all	3		Very often		3
I get a sort of frightened feeling as if something awful is about to happen:			**I have lost interest in my appearance:**		
Very definitely and quite badly		3	Definitely	3	
Yes, but not too badly		2	I don't take quite as much care	2	
A little, but it doesn't worry me		1	I take just as much care as ever	1	
Not at all		0		0	
I can laugh and see the funny side of things:			**I feel restless, as if I have to be on the move:**		3
As much as I always could	0		Very much indeed		2
Not quite as much now	1		Quite a lot		1
Definitely not so much now	2		Not very much		0
Not at all	3		Not at all		
Worrying thoughts go through my mind:			**I look forward with enjoyment to things:**		
A great deal of the time		3	As much as I ever did	0	
A lot of the time		2	Rather less than I used to	1	
From time to time, but not too often		1	Definitely less than I used to	2	
Only occasionally		0	Hardly at all	3	
I feel cheerful:			**I get sudden feelings of panic:**		
Not at all	3		Very often indeed		
Not often	2		Quite often		3
Sometimes	1		Not very often		2
Most of the time	0		Not at all		1
					0
I can sit at ease and feel relaxed:			**I can enjoy a good book or radio or TV programme:**		
Definitely		0	Often	0	
Usually		1	Sometimes	1	

Not often		2	Not often	2	
Not at all		3	Very seldom	3	

Appendix C: Measures

Positive and Negative Affect Schedule (Watson et al., 1988)

Instructions: This questionnaire lists a number of words that describe different feelings and emotions. Indicate to what extent you feel this way **right now**, at the present moment.

Read each word and then list the number from the scale below next to each word.

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

__________ 1. Interested
__________ 2. Distressed
__________ 3. Excited
__________ 4. Upset
__________ 5. Strong
__________ 6. Guilty
__________ 7. Scared
__________ 8. Hostile
__________ 9. Enthusiastic
__________ 10. Proud
__________ 11. Irritable
__________ 12. Alert
__________ 13. Ashamed
__________ 14. Inspired
__________ 15. Nervous
__________ 16. Determined
__________ 17. Attentive
__________ 18. Jittery
__________ 19. Active
__________ 20. Afraid

Appendix C: Measures

Coping Inventory for Task Stressors (Situational Version) (Matthews & Campbell, 1998)

Instructions: Think about how you dealt with any difficulties or problems that arose while you were performing the task. Below are some options for dealing with problems during the task (such as poor performance or negative reactions). Please indicate how much you used each option as a way of dealing with task you have just performed. To answer, circle one of the following answers:

0	1	2	3	4
Not at all	A little bit	Somewhat	Very much	Extremely

1. Worked out a strategy for successful performance	0	1	2	3	4
2. Worried about what I would do next	0	1	2	3	4
3. Stayed detached or distanced from the situation	0	1	2	3	4
4. Decided to save my efforts for something worthwhile	0	1	2	3	4
5. Blamed myself for not doing better	0	1	2	3	4
6. Became preoccupied with my problems	0	1	2	3	4
7. Concentrated hard on doing well	0	1	2	3	4
8. Focussed my attention on the task	0	1	2	3	4
9. Acted as though the task wasn’t important	0	1	2	3	4
10. Didn’t take the task too seriously	0	1	2	3	4
11. Wished that I could change what was happening	0	1	2	3	4
12. Blamed myself for not knowing what to do	0	1	2	3	4
13. Worried about my inadequacies	0	1	2	3	4
14. Made every effort to achieve my goals	0	1	2	3	4
15. Blamed myself for becoming too emotional	0	1	2	3	4
16. Was single-minded and determined to overcome problems	0	1	2	3	4
17. Gave up any attempt to do well	0	1	2	3	4
18. Told myself it wasn’t worth getting upset	0	1	2	3	4
19. Was careful to avoid mistakes	0	1	2	3	4
20. Did my best to follow the instructions for the task	0	1	2	3	4
21. Decided there was no point in trying to do well	0	1	2	3	4

Appendix C: Measures

Thoughts Questionnaire (Negative Subscale) (Edwards, Rapee, & Franklin, 2003)

Instructions: How often have you experienced the following thoughts about the task since it finished? Please circle a number for each statement using the key below:

0	**1**	**2**	**3**	**4**
Never	Not often	Sometimes	Often	Very often

1. I could have done much better	0	1	2	3	4
2. How anxious I felt	0	1	2	3	4
3. I should have chosen a different song	0	1	2	3	4
4. If my blushing/sweating/dry mouth/shaking was obvious	0	1	2	3	4
5. How bad my singing was	0	1	2	3	4
6. I made a fool of myself	0	1	2	3	4
7. How I always do badly in that type of situation	0	1	2	3	4
8. I must have looked stupid	0	1	2	3	4
9. How self-conscious I felt	0	1	2	3	4
10. What a failure I was	0	1	2	3	4
11. How many mistakes I made	0	1	2	3	4
12. How awkward I felt	0	1	2	3	4
13. How fast my heart was pounding	0	1	2	3	4
14. I didn’t make a good impression	0	1	2	3	4
15. The situation overall	0	1	2	3	4

Appendix C: Measures

Big Five Personality Inventory-10 (Rammstedt & John, 2007)

Instructions: How well do the following statements describe your personality?

I see myself as someone who …	Disagree strongly	Disagree a little	Neither agree not disagree	Agree a little	Agree strongly
… is reserved					
… is generally trusting					
… tends to be lazy					
… is relaxed, handles stress well					
… has few artistic interests					
… is outgoing, sociable					
… tends to find fault with others					
… does a thorough job					
… gets nervous easily					
… has an active imagination					

Appendix C: Measures

Balanced Inventory of Desirable Responding Short Form (Hart et al., 2015)

Instructions: Please read the following statements and rate how true they are when thinking about your own thoughts and behaviours. There are no right or wrong answers.

1	**2**	**3**	**4**	**5**	**6**	**7**
Not true			Somewhat true			Very true

I have not always been honest with myself.	1	2	3	4	5	6	7
I always know why I like things.	1	2	3	4	5	6	7
It’s hard for me to shut off a disturbing thought.	1	2	3	4	5	6	7
I never regret my decisions.	1	2	3	4	5	6	7
I sometimes lose out on things because I can’t make up my mind soon enough.	1	2	3	4	5	6	7
I am a completely rational person.	1	2	3	4	5	6	7
I am very confident in judgements.	1	2	3	4	5	6	7
I have sometimes doubted my ability as a lover.	1	2	3	4	5	6	7
I sometimes tell lies if I have to.	1	2	3	4	5	6	7
I never cover up mistakes.	1	2	3	4	5	6	7
There have been occasions when I have taken advantage of someone.	1	2	3	4	5	6	7
I sometimes try to get even rather than forgive and forget.	1	2	3	4	5	6	7
I have said something bad about a friend behind his or her back.	1	2	3	4	5	6	7
When I hear people talking privately, I avoid listening.	1	2	3	4	5	6	7
I never take things that don’t belong to me.	1	2	3	4	5	6	7
I don’t gossip about other people’s business.	1	2	3	4	5	6	7

Appendix C: Measures

Impulse Control Scale from the Short Self-Regulation Questionnaire (Neal & Carey, 2005)

Instructions: Please rate how well each statement describes **you.** Work quickly and don't think too long about your answers.

	Strongly disagree	Disagree a little	Neither agree nor disagree	Agree a little	Strongly agree
I don't notice the effects of my actions until it's too late.					
I put off making decisions.					
It's hard for me to notice when I've 'had enough' (alcohol, food, sweets)					
I have trouble following through with things once I've made up my mind to do something.					
I don't seem to learn from my mistakes.					
I usually only have to make a mistake once in order to learn from it.					
I can usually find several different possibilities when I want to change something.					
Often, I don't notice what I'm doing until someone calls it to my attention.					
I usually think before I act.					
I learn from my mistakes.					
I give up quickly.					

Appendix C: Measures

Subjective Happiness Scale (Lyubomirsky & Lepper, 1999)

Instructions: For each of the following statements and/or questions, please indicate on the scale how appropriate it is in describing you.

1. In general, I consider myself:

1	2	3	4	5	6	7
Not a very happy person						A very happy person

2. Compared to most of my peers, I consider myself:

1	2	3	4	5	6	7
Less happy						Very happy

3. Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this describe you?

1	2	3	4	5	6	7
Not at all						A great deal

4. Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extent does this describe you?

1	2	3	4	5	6	7
Not a very happy person						A very happy person

Appendix C: Measures

Satisfaction with Life Scale (Diener et al., 1985)

Instructions: Below are five statements that you may agree or disagree with. Using the 7-item scale, indicate your agreement with each statement. Please be open and honest in your responding.

7 – Strongly agree

6 – Agree

5 – Slightly agree

4 – Neither agree nor disagree

3 – Slightly disagree

2 – Disagree

1 – Strongly disagree

__________ In most ways my life is close to ideal.

__________ The conditions of my life are excellent.

__________ I am satisfied with my life.

__________ So far, I have gotten the most important things I want in life.

__________ If I could live my life over, I would change almost nothing.

Appendix C: Measures

Passive Active Use Measure (Gerson et al., 2013)

Instructions: How frequently do you perform the following activities when you are on Facebook? (Note: Choosing "Very Frequently" means that about 100% of the time that you log on to Facebook, you perform that activity).

	Never (0%)	Rarely (25%)	Sometimes (50%)	Somewhat frequently (75%)	Very frequently (100%)
Posting updates					
Commenting (on statuses, posts, photos etc.)					
Private messaging					
Checking to see what someone is up to					
Creating or RSVPing to events					
Posting photos					
Tagging photos					
Viewing photos					
Posting videos					
Tagging videos					
Browsing newsfeed passively (without liking or commenting on anything)					
Browsing newsfeed actively (liking and commenting)					
Looking through friends' profiles/updates					

Appendix D

Sing-a-Song Stress Test (PowerPoint Slides) (Brouwer & Hogervorst, 2014)

Slide 1. Breathing exercise	**Slide 2.** Mood questionnaire 1 (PANAS)	**Slide 3.** Instructions
Sit quietly, try to relax and focus your attention on your breathing during the countdown. **2:00**	**Questionnaire 1** Once you have filled out the Mood 1 questionnaire and handed it back to the researcher, please press continue. CONTINUE	In this next section, some statements will be presented to you one at a time. Each statement will be followed by a counter which counts down to zero. **One or more of these statements will instruct you to perform a task.** Please remain sitting still throughout. CONTINUE
Slide 4. Neutral statement 1	**Slide 5.** Neutral statement 2	**Slide 6.** Neutral statement 3
Think of different animals that start with the letter P. **0:30**	Think of things you can find in a kitchen. **0:30**	Think of several things that are important if you want to organise a wedding. **0:30**

Slide 7. Neutral statement 4	**Slide 8.** Stress-inducing statement 1	**Slide 9.** Stress-inducing statement 2
Think of as many team sports practised without a ball as you can. **0:30**	Start singing a song out loud when the counter reaches zero. Keep sitting still until that moment. **This will be recorded.** **1:00**	Sing a song aloud until the counter reaches zero! **This is being recorded.** **1:00**
Slide 10. Mood questionnaire 2 (PANAS)		
Questionnaire 2 Once you have filled out the Mood 2 questionnaire and handed it back to the researcher, please press continue. CONTINUE		

Appendix E

Control Task (from Davis, 2018)

Participants read a magazine article (Deary & Maltby, 2013), and were then presented with the following questionnaire.

Instructions: Below are some questions about the presentation style of the article you have just read. Please indicate your response to each item by circling the appropriate phrase. There are no right or wrong answers.

1. How interesting did you find the subject of this article?

5	4	3	2	1
Very interesting	**Fairly interesting**	**So-so**	**Fairly boring**	**Very boring**

2. Was this article clearly presented (i.e., text size, formatting, images?)

5	4	3	2	1
Very clearly presented	**Fairly clearly presented**	**So-so**	**Fairly unclearly presented**	**Very unclearly presented**

3. Do you feel you have learnt anything new from reading this article?

5	4	3	2	1
Very much so	**A little**	**Don't know**	**Not really**	**Definitely not**

4. Overall, how easy was this article to read?

5	4	3	2	1
Very easy to read	**Fairly easy to read**	**So-so**	**Fairly difficult to read**	**Very difficult to read**

If you would like to make any additional comments about the article, please do so below:

Appendix F: Participant Information Packs

Study 1: Participant Information Sheet

Participant Information Sheet

Title of Project: Emotions

Researcher: Rose Lea

Invitation

I would like to invite you to take part in a research project. Before you decide whether to take part it is important that you understand why the research is being done and what it will involve. Please take time to read this carefully and ask Rose if you have any questions about the study. You can also speak your teachers about the study if you feel this would be helpful.

What is this study for?

This study will try and improve understanding of how we use our emotions in different situations, and how this differs between young people.

Why have I been asked to take part?

You have received this invitation because you are a student aged 16-18 years old. I am hoping to recruit 75 students from your school to take part.

Do I have to take part?

No. If you are interested in psychology or research, you may find the experience useful, but it is up to you to decide if you want to take part. You can withdraw from the study at any time, and you can request for your data to be withdrawn up to 2 weeks after data collection. If you would like to have your data withdrawn please contact Rose with your participation code and your data will then not be used. To take part, you and a parent/guardian will be need to sign the consent form.

What will happen to me if I agree to take part?

There are two parts to the study (both are required). If you agree to take part:
Part 1 (online):

- You will be sent an online link via email
- You will complete 6 online tick-box questionnaires about your personality, emotions and mental health

- You can stop and resume this part of the study as long as all is completed within 1 week (select 'finish later' and follow the instructions). This part should take no longer than 30 minutes in total

Part 2 (face-to-face):

- You will be invited to meet with Rose at a time that suits you (you will be given a choice of time slots to choose from)
- When you arrive, you will be asked to put on a wristband that measures your physical state (it will feel like wearing a wristwatch)
- First, you will in a short questionnaire about how you are feeling
- You will then be asked to read some material, and at some point you may be asked to take part in a task
- Afterwards, you will fill in questionnaires about how you felt during the task
- You will then watch a short (3 minute) video and fill in the last questionnaire
- At the end, I will give you more information on what the study was about

Are there any disadvantages risks to taking part?

If you get upset or anxious easily, we suggest you do not take part in this study. There is a possibility you may find the task stressful, but it is unlikely this will be extreme or last very long. The stress you feel should not be beyond that encountered in everyday life. However, if you don't want to continue, you can stop at any time and do not have to give a reason. If you feel you need to talk to someone after taking part, you can contact the Samaritans by phone (116 123) or via email (jo@samaritans.org). If you would prefer to talk in person, your school offers a counselling service**.** All of these services are free of charge.

Will the information I give stay confidential?

Everything you say as part of the research is confidential unless you tell me something that suggests that you or someone else is at risk of harm. I would discuss this with you before telling anyone else. The responses you give may be used for a research report, but it will not be possible to identify you from the research report or anything else. Information that personally identifies you (e.g. name and contact details) will not be collected, and you will instead be given a research participation number. The research data will be stored securely on the researcher's password-protected device and may be kept for up to 10 years.

What will happen to the results of the research study?

This research is being carried out as part of my PhD at the University of Worcester. The findings of this study will be reported as part of my research reports and may also be published in academic journals or at conferences.

Who is in charge of the research?

Rose is the primary researcher. This research has been approved according to the University of Worcester Ethics Policy.

What happens next?

If you would like to take up this opportunity, please fill in and return the consent form to your teacher. Your parent/legal guardian will also need to sign the form. Please keep this information sheet. If you have any questions or concerns, please contact the researcher (Rose) or her supervisor (Sarah) using the details below.

Rose Lea	Dr. Sarah Davis
r.lea@worc.ac.uk	sarah.davis@worc.ac.uk

If you would like to speak to someone who is not a member of the research team, please contact Dr John-Paul Wilson (Deputy Pro-Vice Chancellor Research) or Louise Heath (Research Support Officer) at the University of Worcester, using the following details:

John-Paul Wilson

j.wilson@worc.ac.uk
Graduate Research School
University of Worcester
Henwick Grove
Worcester WR2 6AJ
01905 542196

Louise Heath

l.heath@worc.ac.uk
Jenny Lind Building 1013
Henwick Grove
Worcester WR2 6AJ
01905 855240

Thank you for taking the time to read this information.

Appendix F: Participant Information Packs

Study 1: Letter to Parents

Rose Lea
PhD Researcher
Email: r.lea@worc.ac.uk

[[Date]]

Dear Parent/Guardian,

Your son/daughter has been offered the opportunity to take part in an exciting psychology research project, entitled *'Emotions'.* This letter should provide some information about the study to help you decide whether or not you consent to your son/daughter taking part.

About the Emotions project

As you may be well aware, mental health problems affect at least 1 in 10 young people, and this figure is likely to increase. The aim of the project is to explore how young people (aged 16-18) use their emotional skills and abilities in different situations. Knowing this could help us determine how best to help improve well-being and reduce the risk of developing mental health problems in the future. The research is in two parts (Part 1: online questionnaires; Part 2: a face-to-face task) – please read the attached Information Sheet for more details.

What are the benefits/risks of taking part?

Students will get to see what it is like to take part in a real life experiment! Many students cover research methods in their A levels, and this is a chance to see research 'in action'. It may also be a useful experience for students to talk about in UCAS personal statements and interviews when applying for University - many courses will involve carrying out research projects in the final year. The opportunity will be especially beneficial for students studying Psychology or any health-related subjects at AS and A Level.
There is a possibility that students may find the task in Part 2 mildly stressful, but it is unlikely this will be extreme or last very long. Therefore, it is not recommended that students take part if they get upset or anxious easily. Students can stop at any point, and will be

given guidance on where to get support if they need it. The researcher has undergone an enhanced DBS check and the research has been given full ethical approval.

Thank you for taking the time to read this information. Please email me, Rose (r.lea@worc.ac.uk), or [Staff Details Here], if you have any questions. If you consent to your son/daughter taking part, *please ensure the attached consent form is signed and returned to college as soon as possible*.

Yours sincerely,

Rose Lea

BSc (Hons) Biology, MSc Psychology

Institute of Health and Society
University of Worcester
Henwick Grove, Worcester, WR2 6AJ

Appendix F: Participant Information Packs

Consent Form (Studies 1 and 2)

University of Worcester

Participant Consent Form

Name of Researcher: Rose Lea

Please initial

I confirm that I have read and understood the information sheet for the above study ☐

I confirm that I have had enough time to consider whether I want to take part in this study ☐

I understand that I do not have to take part and I can change my mind at any time. I understand that I can withdraw my data by contacting the researcher with my participant number up until 2 weeks after data collection ☐

I agree to my research data being used in publications or reports ☐

I agree to take part in the study. ☐

I have been made aware of support services that are available if I need them. ☐

I know who to contact if I have any concerns or questions about this research ☐

Name of participant ______________________________

Date______________ Signature ____________________

Contact email address (required) ____________________

Consent of parent/legal guardian

Name________________________

Date______________ Signature ____________________

Appendix F: Participant Information Packs

Study 2: Participant Information Sheet

Participant Information Sheet

Title of Project: Looking at Emotions

Researcher: Rose Lea

Invitation

I would like to invite you to take part in a research project. Before you decide whether to take part it is important that you understand why the research is being done and what it will involve. Please take time to read this carefully and ask Rose if you have any questions about the study (**r.lea@worc.ac.uk**). You can also speak to any of your teachers about the study if you feel this would be helpful.

What is this study for?

This study will try and improve understanding of how we use our emotions in different situations, and how this differs between young people.

Why have I been asked to take part?

You have received this invitation because you are a student aged 16-18 years old. I am hoping to recruit 50 students from your college to take part.

Do I have to take part?

No. It is up to you to decide whether or not you want to take part in this study. You can decide not to take part or to withdraw from the study at any time, and you can request for your data to be withdrawn up to 2 weeks after data collection. If you would like to have your data withdrawn please contact Rose with your participant ID and your data will then not be used. If you do decide to take part you will be asked to sign a consent form.

What will happen to me if I agree to take part?

There are two parts to the study. If you agree to take part:

Part 1 (online):

- You will be sent an online link

- You will be asked to complete a consent form
- You will complete a video-based emotion recognition task, 4 online tick-box questionnaires about your personality, emotions and mental health, and a short word task
- You can stop and resume this part of the study as long as all is completed within 1 week (just keep your login number given to you by the website).

Part 2 (face-to-face experiment):

- After completing Part 1, you will be invited to meet with Rose at a time that suits you (you will be given a choice of time slots to choose from)
- You will then take part in 2 tasks
- During the experiment, your physical responses will be measured using a wristband (it will feel like wearing a wristwatch). For task 2, an eye-tracker will monitor what you are looking at on a screen
- You may find the first task stressful, but is it important that you remember you can stop at any time, without giving a reason
- After both tasks you will fill in a short questionnaire about your thoughts throughout the task
- You will then watch a short (2 minute) video
- At the end, I will give you more information on what the study was about

Part 1 will take approximately 25 minutes, and Part 2 will take approximately 45 minutes.

Are there any risks to taking part?

If you get upset or anxious easily, we suggest you do not take part in this study. You may find one of the tasks stressful, but it is unlikely this will be extreme or last very long. However, if you don't want to continue, you can stop at any time and do not have to give a reason. If you feel uncomfortable after taking part, you may find it useful to read some information on coping with stress using the links below:

https://www.rcpsych.ac.uk/healthadvice/parentsandyoungpeople/youngpeople/copingwithstress.aspx

http://www.apa.org/news/press/releases/2007/10/stress-tips.aspx

https://www.bigwhitewall.com/v2/Home.aspx?ReturnUrl=%2f

If you feel you need to talk to someone after taking part, you can contact the Samaritans by phone (116 123) or via email (jo@samaritans.org). If you would prefer to talk in person, your school offers a counselling service (***insert school-specific in-house counselling details*).** All of these services are free of charge.

Will the information I give stay confidential?

Everything you say as part of the research is confidential unless you tell me something that suggests that you or someone else is at risk of harm. I would discuss this with you before telling anyone else. The responses you give may be used for a research report, but it will not be possible to identify you from the research report or anything else. Information that personally identifies you (e.g. name and contact details) will not be collected, and you will instead be given a research participation number. The research data will be stored securely on the researcher's password-protected device and may be kept for up to 10 years.

What will happen to the results of the research study?

This research is being carried out as part of my PhD at the University of Worcester. The findings of this study will be reported in my PhD write-up and may also be published in academic journals or at conferences. I may revisit the college to present my research findings to students that have taken part.

Who is in charge of the research?

This research has been approved according to the University of Worcester Ethics Policy.

What happens next?

If you do decide to take part, or have any questions or concerns, please contact the researcher (Rose) or her supervisor (Sarah) using the details below.

Rose Lea	Dr. Sarah Davis
r.lea@worc.ac.uk	sarah.davis@worc.ac.uk

If you would like to speak to an independent person who is not a member of the research team, please contact Karen Dobson (Research Knowledge and Exchange Facilitator) at the University of Worcester, using the following details:

Karen Dobson

karen.dobson@worc.ac.uk
01905 855518

Thank you for taking the time to read this information.

Appendix F: Participant Information Packs

Study 2: Letter to Parents

Rose Lea
PhD Researcher
Email: r.lea@worc.ac.uk

[[Date]]

Dear Parent/Guardian,

Your son/daughter has been offered the opportunity to take part in an exciting psychology research project, entitled *'Looking at Emotions'.* This letter should provide some information about the study to help you decide whether or not you consent to your son/daughter taking part.

About the Looking at Emotions project

As you may be well aware, mental health problems affect at least 1 in 10 young people, and this figure is likely to increase. The aim of the project is to explore how young people (aged 16-18) use their emotional skills and abilities in different situations. Knowing this could help us determine how best to help improve well-being and reduce the risk of developing mental health problems in the future. The research is in two parts (Part 1: online questionnaires; Part 2: two face-to-face tasks) – please read the attached Information Sheet for more details.

What are the benefits/risks of taking part?

Students will get to see what it is like to take part in a real life experiment! Many students cover research methods in their A levels, and this is a chance to see research 'in action' using cutting edge eye-tracking technology. It may also be a useful experience for students to talk about in UCAS personal statements and interviews when applying for University - many courses will involve carrying out research projects. The opportunity will be especially beneficial for students studying psychology or health-related subjects.

There is a possibility that students may find Part 2 stressful, but it is unlikely this will be extreme or last very long. Therefore, it is not recommended that students take part if they get upset or anxious easily. Students can stop at any point, and will be given guidance on where to get support if they need it. The researcher (Rose) has undergone an enhanced DBS check and the research has been given full ethical approval from the University.

Thank you for taking the time to read this information. Please email me, Rose (r.lea@worc.ac.uk), or the head of sixth form, [Details Here), if you have any questions. If you consent to your son/daughter taking part, *please ensure the attached consent form is signed and returned to college as soon as possible*.

Yours sincerely,

Rose Lea
BSc (Hons) Biology, MSc Psychology
University of Worcester, Henwick Grove, Worcester, WR2 6AJ

Appendix F: Participant Information Packs

Study 3: Participant Information Sheet and Consent Form (Embedded in Online Survey)

Participant Information Sheet

Title of Project: Emotional Intelligence and Social Media

Researcher: Rose Lea

Invitation

I would like to invite you to take part in a research project. Before you decide whether to take part it is important that you understand why the research is being done and what it will involve. Please take time to read this carefully and ask Rose if you have any questions about the study. You can also speak to any of your teachers about the study if you feel this would be helpful.

What is this study for?

This study will try and improve understanding of how we use our emotions on social media, and how that differs between young people.

Why have I been asked to take part?

You have received this invitation because you are a student aged 16-18 years. I am hoping to recruit at least 100 participants for this study.

Do I have to take part?

No. It is up to you to decide whether or not you want to take part in this study. You can decide not to take part or to withdraw from the study at any time, and you can request for your data to be withdrawn up to 2 weeks after data collection. If you would like to have your data withdrawn please contact Rose with your participant ID and your data will then not be used. If you do decide to take part you will be asked to sign a consent form.

What will happen to me if I agree to take part?

All parts of the study are online, and can be completed on a computer, laptop, tablet, or smartphone. There are 3 main sections of the study:

- **Part 1**: You will complete a video-based emotion recognition task. Please note, for this part of the study, you will need access to sound either through the device speaker or headphones.
- **Part 2**: You will complete 6 brief questionnaires about your personality, emotions, and wellbeing, and a short word task.
- **Part 3**: You will take part in an image-viewing task. This will involve viewing a newsfeed of posts, similar to a social media newsfeed. After that, you will be asked some short questions about how you felt about the posts that you have seen. Please note: for this part of the study, some of the content you will view can be considered offensive, such as violent pictures. If at any point you wish to stop the study, please close the browser window, or press the "exit survey" button, which will take you straight to the end.
- At the end, you will be given the option of watching a short video. I will give you more information on what the study was about.

You can stop and resume the study as many times as you like before the study closes on the 31st July 2018. To resume the study, just keep your login number given to you by the website. The study should take approximately 35-45 minutes in total.

Are there any disadvantages risks to taking part?

There is a possibility you may find the viewing of the images in the study distressing. But, it is unlikely this will be extreme or last very long. However, if you don't want to continue, you can stop at any time by exiting the browser window without having to give a reason. If you still feel some discomfort after taking part, you may find it useful to read some information on coping with stress using the links below:

https://www.rcpsych.ac.uk/healthadvice/parentsandyoungpeople/youngpeople/copingwithstress.aspx

http://www.apa.org/news/press/releases/2007/10/stress-tips.aspx

Will the information I give stay confidential?

Everything you say as part of the research is confidential unless you tell me something that suggests that you or someone else is at risk of harm. I would discuss this with you before telling anyone else. The responses you give may be used for a research report, but it will not be possible to identify you from the research report or anything else. Information that personally identifies you (e.g. name and contact details) will not be collected. Any contact you have with me (the researcher) will use your participant ID generated at the start of the study. The research data will be stored securely on the researcher's password-protected device and may be kept for up to 10 years.

What will happen to the results of the research study?

This research is being carried out as part of my PhD at the University of Worcester. The findings of this study will be reported as part of my research reports and may also be published in academic journals or at conferences.

Who is in charge of the research?

This research has been approved according to the University of Worcester Ethics Policy.

What happens next?

Please keep a copy this information sheet. If you would like to take part in the study, please continue onto the next page. If you have any questions or concerns, please contact the researcher (Rose) or her supervisor (Sarah) using the details below.

Rose Lea

r.lea@worc.ac.uk

Dr. Sarah Davis

sarah.davis@worc.ac.uk

If you would like to speak to an independent person who is not a member of the research team, please contact Dr John-Paul Wilson (Deputy Pro-Vice Chancellor Research) or Louise Heath (Research Support Officer) at the University of Worcester, using the following details:

John-Paul Wilson

j.wilson@worc.ac.uk
Graduate Research School
University of Worcester
Henwick Grove
Worcester WR2 6AJ
01905 542196

Louise Heath

l.heath@worc.ac.uk
Jenny Lind Building 1013
Henwick Grove
Worcester WR2 6AJ
01905 855240

Participant Consent Form

Title of Project: Emotional Intelligence and Social Media

Name of Researcher: Rose Lea

	Please initial
I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions.	☐
I confirm that I have had enough time to consider whether I want to take part in this study	☐
I understand that I do not have to take part and I can change my mind at any time by exiting the browser.	☐
I understand that I can withdraw my data by contacting the researcher with my participant number up until 2 weeks after data collection	☐
I am aware that I will see potentially distressing images as part of the study.	☐
I agree to my answers to the questions being used in publications or reports.	☐
I have been made aware of support services that are available if I need them.	☐
I know who to contact if I have any concerns about this research.	☐
I agree to take part in the study.	☐

Appendix G

Study 1 Participant Evaluation

FEEDBACK ON EMOTIONS STUDY

1. What made you want to take part in the research? (tick all that apply)

To see what psychology research looks like	
My teacher encouraged me to	
To put on my UCAS statement	
It sounded interesting	
My friends were taking part	

I want to study Psychology at University	
I liked the researcher	
To help improve mental health of future generations	
Other (please state)	

2. How did you find Part 1 (Online Questionnaires)? (draw a cross on each line)

A.	Interesting	Boring
B.	Not enough questions	Too many questions
C.	Varied	Repetitive
D.	Better than I expected	Worse than I expected

3. How did you find Part 2 (Task)? (draw a cross on each line)

A.	Interesting	Boring
B.	Too short	Too long
C.	Not stressful	Stressful
D.	Better than I expected	Worse than I expected

4. Would you take part in research again? (please circle)

Yes Depends on the project No

5. Any other comments?

Appendix H: Study 1 Descriptive Statistics by Experimental Condition

Table H1: Stress Condition

Correlations and Whole-Sample Descriptive Statistics for EI, HR, Stress Reactivity and Stress Recovery under Stressful Conditions (N = 30)

Variables	1	2	3	4	5	7	8	9	10	11	12	13	14	15	16
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	.81***	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	.81***	.51**	-	-	-	-	-	-	-	-	-	-	-	-	-
4. TEI: SO	.80***	.57**	.51**	-	-	-	-	-	-	-	-	-	-	-	-
5. TEI: WB	.90***	.57**	.73***	.67***	-	-	-	-	-	-	-	-	-	-	-
7. AEI: EM	.55**	.61***	.37*	.28	.40*	-	-	-	-	-	-	-	-	-	-
8. HR1	.13	.03	.07	.23	.05	.20	-	-	-	-	-	-	-	-	-
9. HR: REACT	-.03	-.00	.27	-.47*	-.01	.09	-.24	-	-	-	-	-	-	-	-
10. HR: REC	-.07	-.11	-.24	.35	-.06	-.34	-.09	-.83***	-	-	-	-	-	-	-
11. PA1	.48**	.37*	.24	.38*	.50**	.35	.13	-.01	-.15	-	-	-	-	-	-
12. PA: REACT	-.16	-.12	.03	-.18	-.23	-.18	.01	-.02	.13	-.62***	-	-	-	-	-
13. PA: REC	-.03	.02	-.17	.05	.00	-.05	-.01	-.06	-.03	.26	-.75***	-	-	-	-
14. NA1	-.59***	-.47**	-.61*	-.42*	-.47**	-.53**	-.26	.12	-.01	-.26	.16	.00	-	-	-
15. NA; REACT	-.23	-.07	.24	-.21	.20	-.03	-.07	.08	-.17	.06	-.49**	.69***	.02	-	-
16. NA: REC	.33	.08	.36	.34	.29	.13	.12	-.10	.13	.06	.34	-.60***	-.19	-.83***	-
M	4.38	4.72	3.91	4.85	4.25	10.19	72.52	14.74	-13.34	27.50	-.10.03	5.90	15.27	9.40	-12.27
(*SD*)	(1.01)	(1.07)	(1.15)	(.96)	(1.63)	(2.29)	(10.10)	(10.58)	(10.72)	(5.53)	(6.98)	(6.46)	(5.09)	(5.79)	(7.04)
Range	2.33 –	2.63 –	1.67 –	2.17 –	1.00 –	3.33 –	54.00 –	-.98 –	-32.05 –	16.00 –	-22.00 –	-11.00 –	10.00 –	-5.00 –	-32.00 -
	6.67	6.75	6.33	7.00	7.00	13.42	89.00	32.02	2.38	36.00	5.00	18.00	33.00	19.00	.00
Skew	-.24	-.04	-.32	-.97	-.29	-1.31	.04	.33	-.23	-.24	.52	-.36	1.74	-.49	-.30
Kurtosis	.43	.48	-.08	2.32	-.81	1.84	-.44	-1.19	-1.14	-.84	-.49	.69	4.01	-.03	.96

Notes. TEI = Trait emotional intelligence; EM = Emotionality; SC = Self-control; SO = Sociability; WB = Wellbeing; AEI: EM = Ability emotional intelligence (emotional management) REACT = Reactivity; HR = Heart rate, PA = Positive affect; NA = negative affect; REC = Recovery (following positive video); *M* = mean, *SD* = standard deviation. * = p < .05, ** = p < .01, *** = p <.001.

Appendix H: Correlation and Whole-Sample Statistics by Experimental Condition

Table H2: Control Condition

Correlations and Whole-Sample Descriptive Statistics for EI, HR, Stress Reactivity and Stress Recovery under Control Conditions (N = 28)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	**.81****	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	**.82*****	**.57****	-	-	-	-	-	-	-	-	-	-	-	-	-
4. TEI: SO	**.68*****	**.47***	**.42***	-	-	-	-	-	-	-	-	-	-	-	-
5. TEI: WB	**.89*****	**.61****	**.64*****	**.54****	-	-	-	-	-	-	-	-	-	-	-
6. AEI: MAN	.11	.27	.22	-.09	.06	-	-	-	-	-	-	-	-	-	-
7. HR1	.03	.02	-.06	-.01	.13	.17	-	-	-	-	-	-	-	-	-
8. HR: REACT	-.11	-.10	-.24	.19	-.02	-.32	**-.38***	-	-	-	-	-	-	-	-
9. HR: REC	.14	.27	.19	-.02	.07	.29	-.35	.10	-	-	-	-	-	-	-
10. PA1	.39*	.41*	.14	.45*	.31	.23	-.17	.09	.36	-	-	-	-	-	-
11. PA: REACT	.16	.04	.33	.12	-.05	.03	-.24	-.08	.10	-.04	-	-	-	-	-
12. PA: REC	-.07	-.02	-.07	-.07	.-03	.20	.08	-.02	.15	.16	**-.59*****	-	-	-	-
13. NA1	-.12	.26	-.15	.02	-.28	.26	.07	.23	-.05	.01	.15	-.18	-	-	-
14. NA; REACT	-.04	-.20	.05	.11	.01	-.28	.11	.02	.06	-.09	-.09	.28	**-.41***	-	-
15. NA: REC	.07	-.07	.15	-.16	.03	.12	**-.37**	-.21	.02	.04	.11	-.14	-.29	**-.59*****	-
M	4.43	4.81	3.83	4.86	4.43	10.11	82.86	1.70	-3.13	27.18	-6.43	2.71	13.46	-1.32	-1.64
(*SD*)	(.86)	(.82)	(1.02)	(.82)	(1.47)	(2.56)	(17.21)	(2.69)	(5.91)	(5.65)	(4.98)	(5.45)	(2.25)	(3.02)	(2.31)
Range	2.27 –	3.38 –	2.33 –	2.67 –	1.00 –	4.75 –	51.00 –	-2.18 –	-21.82 –	19.00 –	-13.00 –	-5.00 –	10.00 –	-6.00 –	-8.00 –
	5.73	6.25	6.00	5.83	6.50	14.42	115.00	7.72	7.16	36.00	3.00	16.00	20.00	7.00	1.00
Skew	-.45	-.19	.56	-.92	-.80	-.40	.21	.61	-1.13	.12	.37	.89	.77	.96	-1.67
Kurtosis	-.09	-1.09	-.65	.46	-.19	-.63	-.84	-.48	2.44	-1.55	-.15	.34	1.16	.86	2.12

Notes. TEI = Trait emotional intelligence; EM = Emotionality; SC = Self-control; SO = Sociability; WB = Wellbeing; AEI: EM = Ability emotional intelligence (emotional management) REACT = Reactivity; HR = Heart rate, PA = Positive affect; NA = negative affect; REC = Recovery (following positive video); *M* = mean, *SD* = standard deviation. * = p < .05, ** = p < .01, *** = p <.001.

Appendix I: Moderated Mediation Analyses

TEI Sociability

Moderated Mediation Results for Trait Sociability and Physiological Reactivity with 95% Confidence Intervals (n = 55)

Moderated mediation results	Coefficient	LLCI	ULCI
Outcome: Task-focussed coping			
R = .69, *F* (13,41) = 2.82, *p* = .0057			
TEI sociability	.97	-3.30	5.24
Sex	.38	-2.62	3.38
Openness	-.13	-.59	.32
Conscientiousness	.19	-.19	.68
Extraversion	-.37	-.77	.03
Agreeableness	.10	-.32	.53
Neuroticism	.39	-.10	.88
Cognitive ability	.06	-.02	.13
Depression	.18	-.23	.59
Anxiety	-.46	-.92	.01
HR1	-.01	-.11	.09
Outcome: Emotion-focussed coping			
R = .64, *F* (13,41) = 2.16, *p* = .0307			
TEI sociability	-3.26	-10.38	3.85
Sex	4.12	-.88	9.12
Openness	.23	-.53	.99
Conscientiousness	-.38	-1.02	.26
Extraversion	.21	-.45	.87
Agreeableness	-.07	-.77	.64
Neuroticism	.82	.01	1.64
Cognitive ability	.02	-.11	.14
Depression	-.02	-.70	.67
Anxiety	-.25	-1.03	.52
HR1	-.02	-.19	.15
Outcome: Avoidant coping			
R = .63, *F* (13,41) = 2.05, *p* = .0402			
TEI sociability	-6.27	-11.91	-.63
Sex	.91	-3.06	4.87
Openness	-.01	-.61	.60
Conscientiousness	-.05	-.56	.45
Extraversion	.60	.07	1.12
Agreeableness	.40	-.16	.96
Neuroticism	-.59	-1.24	.05

Cognitive ability	-.10	-.20	.00
Depression	.45	-.09	1.00
Anxiety	-.09	-.62	.61
HR1	.07	-.06	.20
Outcome: HR2			
R = .87, *F* (16,38) = 7.71, *p* < .001			
TEI sociability	-19.37	-31.04	-7.70
TEI sociability x group	10.76	3.82	17.70
Task-focussed coping	-.27	-1.17	.63
Emotion-focussed coping	-.04	-.57	.49
Avoidant coping	.04	-.69	.77
Sex	9.13	1.13	17.14
Openness	-1.42	-2.61	-.23
Conscientiousness	-.02	-1.04	1.00
Extraversion	-.06	-1.15	1.03
Agreeableness	-.94	-2.09	.20
Neuroticism	-.59	-2.05	.87
Cognitive ability	.19	-.02	.40
Depression	.09	-1.04	1.23
Anxiety	.08	-1.20	1.35
HR1	.75	.49	1.02
Conditional indirect effects: Task-focussed coping	Effect	BootLLCI	BootULCI
Stress group	-.26	-2.06	1.43
Control group	-.25	-2.42	1.82
Conditional indirect effects: Emotion-focussed coping	Effect	BootLLCI	BootULCI
Stress group	.09	-1.73	2.26
Control group	.05	-1.54	1.83
Condition indirect effects: Avoidant coping	Effect	BootLLCI	BootULCI
Stress group	-.16	-5.43	4.70
Control group	-.09	-2.72	2.14
Direct effect	-19.37	-31.04	-7.70

Note. LLCI = Low Limit Confidence Interval; ULCI = Upper Limit Confidence Interval; BootLLCI = bootstrapped LLCI; bootULCI = bootstrapped ULCL.

Appendix I: Moderated Mediation Analyses

TEI Self-Control

Moderated Mediation Results for Trait Self-Control and Physiological Reactivity with 95% Confidence Intervals (N = 55)

Moderated mediation results	Coefficient	LLCI	ULCI
Outcome: Task-focussed coping *R* = .69, *F* (13,41) = 2.86, *p* = .0052			
TEI self-control	-2.09	-6.39	2.22
Sex	.48	-2.54	3.50
Openness	-.13	-.57	.32
Conscientiousness	.27	-.11	.65
Extraversion	-.31	-.69	.06
Agreeableness	.16	-.26	.57
Neuroticism	.12	-.49	.73
Cognitive ability	.06	-.01	.14
Depression	.17	-.23	.58
Anxiety	-.48	-.94	.02
HR1	.00	-.09	1.00
Outcome: Emotion-focussed coping *R* = .63, *F* (13,41) = 2.08, *p* = .037			
TEI self-control	-2.25	-9.49	5.00
Sex	4.85	-.24	9.94
Openness	.07	-.69	.81
Conscientiousness	-.58	-1.22	.06
Extraversion	.12	-.50	.75
Agreeableness	-.16	-.86	.54
Neuroticism	.86	-.17	1.89
Cognitive ability	.04	-.09	.17
Depression	-.10	-.78	.58
Anxiety	-.02	-.80	.76
HR1	-.06	-.22	.10
Outcome: Avoidant coping *R* = .52, *F* (13,41) = 1.17, *p* = .333			
TEI self-control	-.93	-5.33	7.17
Sex	1.47	-2.93	5.86
Openness	-.17	-.81	.48
Conscientiousness	-.29	-.84	.26
Extraversion	.36	-.18	.91
Agreeableness	.23	-.37	.83
Neuroticism	-.25	-1.14	.64

Cognitive ability	-.09	-.20	.02
Depression	.32	-.26	.91
Anxiety	.17	-.50	.84
HR1	.01	-.13	.15
Outcome: HR2			
R = .86, *F* (16,38) = 6.45, *p* < .001			
TEI self-control	8.49	-3.63	20.61
TEI self-control x group	-2.08	-8.99	4.83
Task-focussed coping	.04	-.94	1.01
Emotion-focussed coping	-.03	-.61	.55
Avoidant coping	.42	-.31	1.15
Sex	9.53	.77	18.30
Openness	-1.05	-2.30	-.19
Conscientiousness	-.53	-1.63	.57
Extraversion	-.19	-1.26	.88
Agreeableness	-1.38	-2.56	-.19
Neuroticism	1.28	-.51	3.07
Cognitive ability	.14	-.09	.37
Depression	-.30	-1.47	.87
Anxiety	.04	-1.31	1.39
HR1	.65	.39	.92
Conditional indirect effects: Task-focussed coping	Effect	BootLLCI	BootULCI
Stress group	-.05	-3.10	1.53
Control group	-.01	-1.39	1.24
Conditional indirect effects: Emotion-focussed coping	Effect	BootLLCI	BootULCI
Stress group	.02	-1.89	1.60
Control group	-.04	-1.35	1.31
Condition indirect effects: Avoidant coping	Effect	BootLLCI	BootULCI
Stress group	.19	-2.01	3.50
Control group	-.01	-1.31	1.96
Direct effect	8.49	-3.63	20.61

Note. LLCI = Low Limit Confidence Interval; ULCI = Upper Limit Confidence Interval; BootLLCI = bootstrapped LLCI; bootULCI = bootstrapped ULCL.

Appendix J

Supplementary Information on the Construction of the Emotion Recognition Test (ERT) Used in Studies 2 and 3

To assess the perception branch of AEI, an emotion recognition test (ERT) that fulfilled three criteria was sought. Because a suitable test that satisfied all criteria could not be identified, a new ERT was developed for the purposes of the present study.

The bespoke test contained stimuli from the Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS; Livingstone & Russo, 2018). The RAVDESS is a relatively new, multimodal database of 7,356 validated, emotional stimuli, where 24 actors (12 female, 12 male) vocalise two neutral, lexically-matched statements ("Kids are talking by the door", "Dogs are sitting by the door"), with a variety of emotional expressions (neutral, calm, happy, sad, angry, fearful, surprise, and disgust), at two levels of intensity (normal, strong), each with two repetitions. Recordings are available in both speech and song, in audiovisual, audio only, and visual only, formats. For the audiovisual stimuli, the authors report high levels of emotional validity (80%), inter-rater reliability (kappa = .53 - .61), and test-retest reliability (kappa = .73) (Livingstone & Russo, 2018). All RAVDESS files are freely available to use under a Creative Commons Non-Commercial license. While new, the RAVDESS has been successfully used in various emotion studies in recent years (e.g., Cunningham, Weinel, & Picking, 2018; Kurbesov, Ryabkin, Miroshnichenko, Aruchidi, & Kalugyan, 2019; Venkataramanan & Rajamohan, 2019; Zamil, Hasan, Baki, Adam, & Zaman, 2019).

The ERT comprised 36 items, plus two practice items, a task length deemed appropriate, based on similar measures (e.g., the GERT-S; Schlegel & Scherer, 2015). Selection of RAVDESS stimuli for the ERT took a systematic approach, with several 'filters' applied to reduce the 1,440 speech-based, audiovisual files down to 36. First, the number of included actors was restricted to 10 (e.g., Multimodal Emotion Recognition Test [MERT]; Banziger et al., 2009; Geneva Emotion Recognition Test [GERT]; Schlegel & Scherer, 2015), whereby a random number generator was used to select 5 male and 5 female actors from the pool of 24. The randomisation process was repeated until the mean accuracy of the 10 actors was equivalent to the accuracy rate of other published tests (~70%). This was made possible by actor-specific emotional accuracy information made available by the RAVDESS authors. Second, of the 8 emotions depicted in the RAVDESS, only 6 (happiness, sadness, anger, fear, disgust, surprise) were represented in the ERT, to correspond with Ekman's theory of six basic universal emotions (e.g., Ekman & Oster, 1979). Third, only the 'normal' (not 'high') intensity stimuli were selected, in order to attain a marker of skilled emotion recognition, and avoid ceiling effects. Fourth, equal representations of each of the two statements (i.e., "kids…", "dogs…"), and of each repetition (i.e., 1st, 2nd), were included. In the final ERT, participants view each of the 36 videos video in a random order, and choose the emotion they think is being expressed from a choice of six. Responses are scored as either correct (1) or incorrect (0). Total scores (% correct) are computed for each participant by dividing the number of correct responses by the total number of responses provided, and multiplying by 100.

Presented below are the file numbers of the stimuli used from the RAVDESS (Livingstone & Russo, 2018), organised by emotion type:

Happy:

01-01-03-01-01-01-03

01-01-03-01-01-01-15

01-01-03-01-01-01-20

01-01-03-01-02-02-04

01-01-03-01-02-01-14

01-01-03-01-02-02-13

Sad:

01-01-04-01-01-01-03

01-01-04-01-01-01-18

01-01-04-01-01-02-09

01-01-04-01-01-02-16

01-01-04-01-02-01-04

01-01-04-01-02-01-05

Angry:

01-01-05-01-02-01-16

01-01-05-01-02-01-20

01-01-05-01-01-01-15

01-01-05-01-01-01-18

01-01-05-01-01-02-13

01-01-05-01-02-01-05

Fearful:

01-01-06-01-01-01-04

01-01-06-01-01-01-05

01-01-06-01-02-01-14

01-01-06-01-02-01-16

01-01-06-01-02-02-03

01-01-06-01-02-02-13

Disgust:

01-01-07-01-01-01-05

01-01-07-01-01-01-15

01-01-07-01-01-02-18

01-01-07-01-01-01-20

01-01-07-01-02-02-09

01-01-07-01-02-02-14

Surprise:

01-01-08-01-01-01-03

01-01-08-01-01-01-09

01-01-08-01-01-01-15

01-01-08-01-01-01-20

01-01-08-01-01-02-04

01-01-08-01-02-01-18

Practice videos:

01-01-01-01-01-01-01 (neutral)

01-01-04-01-01-02-08 (sad)

Appendix K

Study 2 Preliminary Analyses: Bias for Emotions by Experimental Condition

Bias for Emotion as a Function of Emotion Type and Experimental Condition, Calculated by Manual Reaction Time

	Experimental group						95% CI for Mean Difference		
	Stress			Control					
	M	*SD*	*n*	*M*	*SD*	*n*		*t*	*df*
Angry	2.16	21.89	31	4.02	16.93	29	-12.01, 8.31	-.37	58
Sad	6.78	21.27		-4.90	23.67		.07, 23.29	**2.01***	58
Happy	6.17	28.47		-.37	17.47		-5.78, 18.84	1.06	58

Note. *M* = mean; *SD* = standard deviation. Positive values denote bias towards emotion, negative values denote bias away from emotion. *= *p* < 05.

Bias for Emotion as a Function of Emotion Type and Experimental Condition, Calculated by First Fixation

	Experimental group						95% CI for Mean Difference		
	Stress			Control					
	M	*SD*	*n*	*M*	*SD*	*n*		*t*	*df*
Angry	.49	.10	29	.52	.11	28	-.09, .03	-1.08	55
Sad	.49	.10		.49	.06		-.04, .05	.32	55
Happy	.46	.11		.48	.06		-.08, .02	-1.14	55

Note. *M* = mean; *SD* = standard deviation. Values > .50 denote bias towards emotion, values < .50 denote bias away from emotion.

Appendix L: Study 2 Descriptive Statistics by Experimental Condition

Table L1: Stress Condition

Correlations and Whole-Sample Descriptive Statistics for EI, Reactivity, and Rumination under Stressful Conditions (N = 31)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	**.77***	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	**.58**	**.46**	-	-	-	-	-	-	-	-	-
4. TEI: SO	**.57**	.23	.23	-	-	-	-	-	-	-	-
5. TEI: WB	**.87***	**.50**	**.38***	**.48**	-	-	-	-	-	-	-
6. AEI: EM	.11	.34	.27	-.23	.00	-	-	-	-	-	-
7. AEI: EP	-.06	.14	-.05	-.17	-.10	.04	-	-	-	-	-
8. NA: REACT	-.17	-.04	-.03	-.32	-.14	.20	-.22	-	-	-	-
9. HR: REACT	-.04	-.16	-.01	.00	.05	.13	-.14	-.02	-	-	-
10. EDA: REACT	-.22	-.31	-.26	.05	-.14	**-.47***	.15	-.17	.11	-	-
11. RUM	**-.48**	-.20	**-.44***	-.23	**-.47**	.04	-.14	.29	-.09	-.12	-
M	4.23	4.39	3.67	4.88	3.98	10.40	76.23	8.06	18.68	252.36	23.81
(*SD*)	(.80)	(1.06)	(.73)	(.78)	(.73)	(2.26)	(8.00)	(4.89)	(21.16)	(409.10)	(15.18)

Notes. TEI = Trait emotional intelligence; TEI: EM = Emotionality; SC = Self-control; SO = Sociability; WB = Wellbeing; AEI (EM)= Ability emotional intelligence (emotional management; AEI (PER) = Ability emotional intelligence (Emotion perception); REACT = Reactivity; HR = Heart rate, EDA = electrodermal activity; NA = negative affect; *M* = mean, *SD* = standard deviation. For HR and EDA reactivity, the value represents % change from baseline to T2. * = *p* < .05, ** = *p* < .01, *** = *p* <.001.

Appendix L: Study 2 Descriptive Statistics by Experimental Condition

Table L2: Control Condition

Correlations and Whole-Sample Descriptive Statistics for EI, Reactivity, and Rumination under Stressful Conditions (N = 29)

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	**.81*** **	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	**.72*** **	**.38***	-	-	-	-	-	-	-	-	-
4. TEI: SO	**.62*** **	**.67*** **	.09	-	-	-	-	-	-	-	-
5. TEI: WB	**.88*** **	**.65** **	**.56** **	**.37***	-	-	-	-	-	-	-
6. AEI: MAN	**.27**	**.30**	.05	.35	.21	-	-	-	-	-	-
7. AEI: PER	-.33	-.37	-.27	-.44*	-.16	-.09	-	-	-	-	-
8. NA: REACT	.37	.20	.22	.29	**.42***	-.03	.03	-	-	-	-
9. HR: REACT	.11	.12	-.02	.13	.19	-.03	.09	.29	-	-	-
10. EDA: REACT	.05	.06	.12	.05	-.07	.03	**-.44***	**-.49** **	**-.37***	-	-
11. RUM	**-.48** **	**-.43** **	-.33	-.25	**-.50** **	-.50**	-.03	-.24	-.17	-.12	-
M	4.44	4.67	3.93	4.98	4.33	10.78	77.18	-1.14	1.51	56.86	.80
(*SD*)	(.81)	(.92)	(1.12)	(.77)	(1.42)	(2.29)	(6.78)	(2.72)	(11.57)	(145.70)	9.87

Notes. TEI = Trait emotional intelligence; TEI: EM = Emotionality; SC = Self-control; SO = Sociability; WB = Wellbeing; AEI (EM)= Ability emotional intelligence (emotional management; AEI (PER) = Ability emotional intelligence (Emotion perception); REACT = Reactivity; HR = Heart rate, EDA = electrodermal activity; NA = negative affect; *M* = mean, *SD* = standard deviation. For HR and EDA reactivity, the value represents % change from baseline to T2. * = p < .05, ** = p < .01, *** = p <.001.

Appendix M: Pooled Sample Analyses

Preliminary Analyses

Relationships between study variables

Table M1 displays whole-sample descriptive statistics and bivariate intercorrelations for the questionnaire battery variables from the pooled sample (TEI, AEI, personality dimensions, cognitive ability, depression, anxiety). Expectedly, findings broadly embodied those of Study 1 and 2.

Stress manipulation check

The manipulation had a powerful impact on all stress indices for participants in the stress condition, demonstrated by significant increases in NA and HR from baseline. NA and HR did not significantly change for the control group. There was a significant time X condition interaction for NA ($F(1,110) = 90.33$, $p < .001$, $n^2_{partial} = .45$). Post-hoc testing confirmed that the stressful task significantly increased NA levels ($M_{change} = 8.64$, $SD = 5.54$, $t(1, 55) = 11.56$, $p < .001$), whereas those in the control group showed no significant change ($p > .05$). A significant time x condition interaction also emerged for HR ($F(1,107) = 28.96$, $p < .001$, $n^2_{partial} = .21$). The stressful task, but not the control task ($p > .05$), also induced a significant increase a 21.80% increase in HR ($M_{change} = 11.97$ bpm, $SD = 12.06$, $t(1, 55) = 7.11$, $p < .001$).

Appendix M: Pooled Sample Analyses

Table M1

Correlations and Whole-Sample Descriptive Statistics for EI, Personality, Cognitive Ability and Mental Health (Pooled Sample from Studies 1 and 2 ([N = 138])

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. TEI: total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2. TEI: EM	**.78*** **	-	-	-	-	-	-	-	-	-	-	-	-	-
3. TEI: SC	**.76*** **	**.45*** **	-	-	-	-	-	-	-	-	-	-	-	-
4. TEI: SO	**.64*** **	**.44*** **	**.27** **	-	-	-	-	-	-	-	-	-	-	-
5. TEI: WB	**.88*** **	**.56*** **	**.61*** **	.48***	-	-	-	-	-	-	-	-	-	-
6. AEI: EM	**.26** **	**.36*** **	**.22** **	.07	.17	-	-	-	-	-	-	-	-	-
7. O	-.10	-.05	-.04	-.05	-.13	-.02	-	-	-	-	-	-	-	-
8. C	.44	-.19	**.35*** **	**.24** **	**.34*** **	.07	-.14	-	-	-	-	-	-	-
9. E	**.31*** **	**.36*** **	.06	**.47*** **	**.25** **	.00	-.03	.07	-	-	-	-	-	-
10. A	**.33*** **	**.56*** **	.16	**.24** **	.11	.23	.03	.20	.11	-	-	-	-	-
11. N	**-.65*** **	**-.31*** **	**-.68*** **	**-.37*** **	-.62	-.04	.12	**-.21***	**-.17***	.02	-	-	-	-
12. GC	.01	-.01	.05	.03	-.01	.13	**.24** **	.01	-.12	.04	-.04	-	-	-
13. ANX	**-.57*** **	**-.39*** **	**-.50*** **	**-.32*** **	**-.52*** **	-.02	.10	-.18*	**-.19***	**-.18***	**.60*** **	-.04	-	-
14. DEP	**-.50*** **	**-.41*** **	**-.41*** **	**-.23** **	**-.50*** **	-.06	.08	-.18*	-.15	**-.30*** **	**.37*** **	.00	**.76*** **	-
M	4.38	4.64	3.82	4.94	4.27	10.33	14.63	12.83	12.05	16.00	13.95	60.95	13.45	8.33
(*SD*)	(0.85)	(0.94)	(1.02)	(0.80)	(1.51)	(2.24)	(2.87)	(3.26)	(3.80)	(3.34)	(3.74)	(17.78)	(5.79)	(5.35)

Range	2.27 – 6.67	2.13 – 6.75	1.67 – 6.33	2.17 – 7.00	1.00 – 7.00	3.33 – 14.42	7.00 – 20.00	5.00 – 20.00	4.00 – 20.00	4.00 – 20.00	4.00 – 20.00	11.11 – 100	0.00 – 27.00	0.00 – 23.00
Skew	-.20	-.19	.14	-.82	-.30	-.75	-.35	.17	-.18	-1.15	-.45	.14	.03	.25
Kurtosis	-.15	-.20	-.27	1.21	-.86	.43	.26	-.43	-.80	-1.44	-.25	-.41	-.19	-.69
α	.90	.67	.61	.57	.91	.64	.71	.64	.81	.80	.78	.70	.84	.73

Notes. TEI = Trait emotional intelligence; EM = Emotionality; SC = Self-control; SO = Sociability; WB = Wellbeing; AEI (EM)= Ability emotional intelligence (emotional management); O = Openness; C = Conscientiousness; E = Extraversion; A = Agreeableness; N = Neuroticism; GC = Crystallised intelligence; ANX = Trait anxiety; DEP = Trait depression; M = mean, SD = standard deviation, α = Cronbach's alpha coefficient. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Appendix M: Pooled Sample Analyses

Main Analyses: EI and Stress Reactivity (Hypothesis 1)

TEI and stress reactivity

For the prediction of **NA** from global TEI, different findings emerged for the pooled sample than those obtained from the individual samples for Studies 1 and 2. While covariates (ΔR^2 = .04, *p* = .220), and the subsequent addition of global TEI (ΔR^2 = .00, *p* = .854) did not significantly improve the model, adding in the TEI x condition significantly increased R^2 (ΔR^2 = .02, *F*(1, 98) = 15.61, *p* = .010, adjusted R^2 = .63). Simple slopes analyses were conducted to probe this finding further. There was a statistically significant negative relationship (*b* = -.81, *SE* = .80) between TEI and NA reactivity in the stress condition (*p* = .03). In contrast, the relationship (*b* = 1.35, *SE* = .76) between TEI and NA reactivity in the control condition was not significant (*p* = .081). However, consistent with data from Study 2 (but not data from Study 1), global TEI did not predict **HR** reactivity. The addition of covariates did not improve the model fit (R^2 change = .14, *p* = .08), TEI (ΔR^2 = .00, *p* = .727), nor the TEI x condition (ΔR^2 = .00, *p* = .657) resulted in a significant increase to R^2.

While the addition of all four TEI subfactor scores did not significantly improve the model for predicting **NA** reactivity (ΔR^2 = .00, *p* = .223), the model was improved when the subfactor product vectors were included (ΔR^2 = .04, *F*(4,92) = 10.85, *p* = .025, adjusted R^2 = .63). However, only the trait sociability subfactor (*β* = -.59, *p* = .010) and its condition interaction (*β* = .58, *p* = .012) were significant at the final step, in contrast to Study 1. Simple slopes analyses revealed a negative relationship between TEI and NA reactivity in the stress condition (*b* = -2.34, *SE* = .79, *p* = .004), but no relationship in the control condition (*b* = 1.37, *SE* = .15, *p* = .082). Consistent with Study 1, adding TEI subfactors (ΔR^2 = .00, *p* = .228) did not improve the HR reactivity model, whereas entering the interaction terms for the subfactors significantly improved R^2 (ΔR^2 = .07, F(4,86) = 2.99, p = .049, adjusted R^2 = .29). However, as with the NA analyses above, only sociability was a significant predictor of HR reactivity (β = -.86, p = .011), with the sociability interaction term approaching significance (β = .62, p = .058). Simple slopes analyses revealed a non-significant relationship between sociability and NA reactivity in the control condition (b = 1.16, SE = 2.26, p = .615), but a negative relationship between sociability and HR reactivity that trended towards significance in the stress condition (b = -3.55, SE = 2.14, p = .092). To investigate this further, a GLM was constructed to assess differences between the regression lines. For the mean sociability score (M = 4.88), the difference between HR change for the control group (M = 2.20%) and the stress group (M = 15.69%) is 13.49%, 95% CI [8.46, 18.49], p < .001. Thus, results indicate that sociability had a significant negative relationship with HR change in the stress group (Field, 2017). In sum, global TEI predicted less mood deterioration, but had no effect on physiological reactivity. The TEI sociability subfactor played a significant role under stressful conditions, whereby higher scores predicted less NA *and* less HR reactivity. Reactivity analyses for TEI are summarised in **Tables M2** and **M3.**

AEI and stress reactivity

Consistent with Study 1, entering AEI (EM) into the NA reactivity model (ΔR^2 = .00, p = .869) and subsequent conditional effects (ΔR^2 = .00, p = .572) did not produce a significant R^2 increase. Similarly, AEI (EM) failed to improve the HR reactivity model (ΔR^2 = .00, p = .432; conditional effects ΔR^2 = .01, p = .323).

In general, pooled-sample findings were a combination of those obtained from the separate Study 1 and 2 samples. In the stress group, global TEI predicted less NA reactivity (it did not in Study 1 or 2 separately). A more detailed investigation into TEI's component factors revealed that, under stress, the TEI sociability subfactor predicted less NA reactivity (supporting Study 2) and less HR reactivity (supporting Study 1). AEI did not predict either NA or HR reactivity (consistent with findings from Study 1 and Study 2).

Appendix M: Pooled Sample Analyses

Table M2

Summary Statistics for Regressions of Stress Reactivity onto Pretask State, Condition, Personality, Cognitive Ability, Mental Health, and Global TEI Predictors (Pooled Sample from Studies 1 and 2) (N = 118)

	Step 1: Pretask state		Step 2: Condition			Step 3: FFM, cognitive ability, mental health			Step 4: TEI			Step 5: TEI x condition interaction			Significant EI and covariate predictors (at Step 5)
Criterion	R^2	$F(1,110)$	R^2	ΔR^2	$\Delta F(1,109)$	R^2	ΔR^2	$\Delta F(9,100)$	R^2	ΔR^2	$\Delta F(1,99)$	R^2	ΔR^2	$\Delta F(1,98)$	
NA	.29	**45.25***	.61	.32	**88.85***	.65	.04	1.34	.65	.00	.04	.67	.02	**6.76***	TEI (β = -.50*) TEI x Condition (β = .51*)
HR	.02	2.46	.20	.18	**23.34***	.34	.14	1.70	.34	.00	.13	.34	.00	.21	Gc (β = .83**) Gc x Condition (β = -.66*) ANX (β = 1.00*) ANX x Condition (β = -.99*)

Note. NA = negative affect; HR = heart rate; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; Gc = vocabulary test score; ANX = trait anxiety. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Appendix M: Pooled Sample Analyses

Table M2

Summary Statistics for Regressions of Stress Reactivity onto Pretask State, Condition, Personality, Cognitive Ability, Mental Health, and TEI Subfactor Predictors (Pooled Sample from Studies 1 and 2) (N = 118)

	Step 1: Pretask state		Step 2: Condition			Step 3: FFM, cognitive ability, mental health			Step 4: Emotionality, Self-Control, Sociability, Wellbeing			Step 5: Subfactor x condition interactions			Significant EI and covariate predictors (at Step 5)
Criterion	R^2	$F(1,110)$	R^2	ΔR^2	$\Delta F(1,109)$	R^2	ΔR^2	$\Delta F(9,100)$	R^2	ΔR^2	$\Delta F(4,96)$	R^2	ΔR^2	$\Delta F(4,92)$	
NA	.29	**45.25*** **	.61	.32	**88.85*** **	.65	.04	1.34	.65	.00	.08	.69	.04	**2.87***	SOC (β = -.59) SOC x Condition (β = .58*)
HR	.02	2.46	.20	.18	**23.34*** **	.34	.14	1.70	.37	.03	.92	.43	.06	**2.49***	SOC (β = -.86*) SOC x Condition (β = .62) Gc (β = .92**) Gc x Condition (β = -.76**) ANX x Condition (β = -.99*)

Note. NA = negative affect at Time 2; HR = heart rate at Time 2; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; SOC = TEI (sociability factor); Gc = vocabulary test score; trait anxiety. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.. * = $p < .05$, ** = $p < .01$, *** = $p < .00$

Appendix N: EI and First Fixation Analyses

Global TEI and First Fixations

Summary Statistics for Regressions of Bias (First Fixations) for Different Emotions onto Condition, Personality, Cognitive Ability, Mental Health, and Global TEI Predictors (N = 60)

	Step 1: Condition		Step 2: FFM, cognitive ability, mental health			Step 3: TEI			Step 4: TEI x condition			Significant EI and covariate predictors (at Step 4)
Criterion	R^2	$F(1,55)$	R^2	ΔR^2	$\Delta F(10,45)$	R^2	ΔR^2	$\Delta F(1,44)$	R^2	ΔR^2	$\Delta F(1,43)$	
ANG	.02	1.17	.14	.12	.68	.15	.01	.63	.17	.02	.70	None
SAD	.00	.10	.31	.31	**1.82***	.32	.01	1.75	.40	.08	2,17	C (β = .38**) ANX (β = -.12*) SAGE (β = .46**)
HAP	.06	3.12	.32	.26	2.28	.34	.02	2.25	.34	.00	2.00	None

Note. ANG = bias for angry faces; SAD = bias for sad faces; HAP = bias for happy faces; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; C = conscientiousness; ANX = trait anxiety; SAGE = subjective age. * = p < .05; ** = p < .01.

Appendix N: EI and First Fixation Analyses

TEI Subfactors and First Fixations

Summary Statistics for Regressions of Bias (First Fixations) for Different Emotions onto Condition, Personality, Cognitive Ability, Mental Health, and TEI Subfactor Predictors (N = 60)

	Step 1: Condition		Step 2: FFM, cognitive ability, mental health			Step 3: Emotionality, Self-Control, Sociability, Wellbeing			Step 4: Subfactor x condition interactions			Significant EI and covariate predictors (at Step 4)
Criterion	R^2	F(1,58)	R^2	ΔR^2	ΔF(10,48)	R^2	ΔR^2	ΔF(4,44)	R^2	ΔR^2	ΔF(4,40)	
ANG	.02	1.17	.14	.12	.68	.30	.16	1.15	.43	.13	1.48	None
SAD	.00	.10	.31	.31	**1.82***	.45	.14	2.07	.55	.10	2.24	SOC (β = 1.27*) SOC x Condition (β = -1.49*)C (β = .42**) ANX (β = - 1.57*) ANX x Condition (β = 1.34*) SAGE (β = .65***)
HAP	.06	3.12	.32	.26	2.28	.38	.06	1.88	.40	.02	1.42	E (β = 41*)

Note. ANG = bias for angry faces; SAD = bias for sad faces; HAP = bias for happy faces; FFM = Five Factor Model personality traits; TEI = trait emotional intelligence; SOC = TEI sociability; C = conscientiousness; ANX = trait anxiety; SOC = TEI (sociability factor); E = extraversion; SAGE = subjective age; * = p < .05, ** = p < .01.

Appendix N: EI and First Fixation Analyses

AEI (Emotion Management) and First Fixations

Summary Statistics for Regressions of Bias (First Fixations) for Different Emotions onto Condition, Personality, Cognitive Ability, Mental Health, and AEI (Emotion Management) Predictors (N = 60)

	Step 1: Condition		Step 2: FFM, cognitive ability, mental health			Step 3: AEI (EM)			Step 4: AEI x condition interaction			Significant EI and covariate predictors (at Step 4)
Criterion	R^2	F(1,55)	R^2	ΔR^2	ΔF(10,45)	R^2	ΔR^2	ΔF(1,44)	R^2	ΔR^2	ΔF(1,43)	
ANG	.02	1.17	.14	.12	.63	.19	.05	2.59	.19	.00	.08	None
SAD	.00	.10	.31	.31	1.99	.32	.01	.88	.32	.00	.09	None
HAP	.03	1.30	.23	.20	1.22	.23	.00	.13	.24	.01	.19	None

Note. ANG = bias for angry faces; SAD = bias for sad faces; HAP = bias for happy faces; FFM = Five Factor Model personality traits; AEI (EM) = emotional intelligence (emotion perception).

Appendix N: EI and First Fixation Analyses

AEI (Emotion Perception) and First Fixations

Summary Statistics for Regressions of Bias (First Fixations) for Different Emotions onto Condition, Personality, Cognitive Ability, Mental Health, and AEI (Emotion Perception) Predictors (N = 60)

	Step 1: Condition		Step 2: FFM, cognitive ability, mental health			Step 3: AEI (EP)			Step 4: AEI x condition interaction			Significant EI and covariate predictors (at Step 4)
Criterion	R^2	$F(1,58)$	R^2	ΔR^2	$\Delta F(10,48)$	R^2	ΔR^2	$\Delta F(1,47)$	R^2	ΔR^2	$\Delta F(1,46)$	
ANG	.00	.21	.28	.28	.171	.30	.02	1.04	.30	.00	.18	None
SAD	.00	.10	.31	.31	1.99	.31	.00	.07	.34	.00	.91	SAGE (β = .36*) C (β = .37*)
HAP	.02	1.30	.34	.32	.99	.38	.04	2.18	.47	.09	**6.28***[4]	AEI (EP) (β = 1.37**) AEI (EP) X Condition (β = 1.23)

Note. ANG = bias for angry faces; SAD = bias for sad faces; HAP = bias for happy faces; FFM = Five Factor Model personality traits; AEI (EM) = emotional intelligence (emotion perception); C = conscientiousness; SAGE = subjective age. * = p < .05, ** = p < .01.

[4] While the addition of the AEI (EP) x condition variable significantly improved the happiness bias model at step 4, the final model was not statistically significant ($F(1, 46)$ = 1.49, p = .143, adjusted R^2 = .16).

Appendix O: Design and Construction of the Social Media Task for Study 3

To assess how individuals might regulate their emotions upon exposure to emotive material on social media, a task was developed for the purposes of the present study. That process is outlined below.

The first stage of developing the social media task involved selecting the emotional material to use as a base for the social media posts. Typically, emotion research laboratories employ their own (often unvalidated) idiosyncratic emotion stimuli, which is not often available to others, resulting in replicability, interpretability, and generalisability issues (Bradley & Lang, 2007). The International Affective Picture System (IAPS; Lang et al., 2008) was developed to address the problem of emotional stimulus standardisation in emotion research, comprising a large database of 1,182 normatively rated, emotional colour images for use in studies of emotion and attention. The social media task was thus developed using images from the IAPS. IAPS images vary in their elicitation of a range of human emotion (e.g., joy, disgust, fear, sadness, anger; Mikels, Fredrickson, Larkin, Lindberg, Maglio, & Reuter-Lorenz, 2005), and portray a vast array of categories, for example: people, landscapes, bodies, insects, photojournalism from wars and disasters, medical treatments, baby animals, household objects. Importantly, IAPS images are freely available for academic researchers to use, which enables study replication. Furthermore, each image is accompanied by normative ratings on three dimensions, based on how pleasant/unpleasant (valence), how calm/excited (arousal), and how controlled/in-control (dominance), a sample of over 100 participants felt when viewing the picture (Lang et al., 2008). The IAPS has been extensively validated cross-culturally (e.g., Aluja, Rossier, Blanch, Blanco, Martí-Guiu, & Balada, 2015), and in children and adolescents (Hernández et al., 2013; Vasa et al., 2011).

Based on other IAPS studies of emotion (e.g., Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000; McManis, Bradley, Berg, Cuthbert, & Lang, 2001), and attention (e.g., Grossman, Ellsworth, & Hong, 2011; Papies, Barsalou, & Custers, 2012) a total of 48 'posts' (images) was deemed sufficient for the present study, with 24 images each for the positive and negative categories. Ensuring the negative images in the social media task were appropriate for the age range in question (16-18 years) was a high priority for the researcher. Therefore, empirical work that examined adolescents' responses to the IAPS was consulted for information on valence and arousal ratings of images typically used (Hernández et al., 2013, Vasa et al., 2011). Images with similar ratings were subsequently selected for the present study, whilst also ensuring that the (equal) ratio of image types (i.e., animals, objects, people, scenes) was balanced across positive and negative categories. As a further precaution, the British Board of Film Classification website was also consulted for reference on visual material deemed legally suitable for viewing by adolescents aged 15 and over (http://www.bbfc.co.uk/what-classification/15), which states material may include: discriminatory language or behaviour, drug taking (though no instructional detail), dangerous behaviour, nudity and sexual content (though no strong detail), and strong threat and horror (without focus on sadistic or sexual threat), strong violence (without dwelling on infliction of pain or injury). Some images included in the study met the criteria above (age 15+), but none met criteria for material only suitable for viewing by ages 18+ years (http://www.bbfc.co.uk/what-classification/18). Although the IAPS images are emotionally provocative by design, the types of images are comparable to those easily found on television, in magazines and newspapers, and there have been no reported effects on mental health attributable to viewing IAPS images (Bradley & Lang, 2007). However, several steps were taken to ensure participants' wellbeing throughout the study. Participants were fully informed about the types of images they would see, and reminded that they could withdraw at any time, in the information sheet, and throughout the study ("Some of the pictures you will see in this study may include content that can be considered offensive, such as violent pictures. If at any point you wish to stop the study, please click here to be taken to the end"). To restore participants to their normative mood, a mood relief video was shown at the end of the study (confirmed as mood-enhancing by study 1). Participants were not identifiable from their responses in the study, thus maintaining anonymity. Assignment of images to positive or negative categories was determined by IAPS valence and arousal ratings used for adolescent samples in comparable studies (Hernández et al., 2013; Vasa et al., 2011; **Table O1**). The IAPS arousal and valence ratings for the 48 images used in the present study can be found in **Table O2.**

Table O1

Mean Valence and Arousal Ratings of Images in the Present Study and Two Other Studies with Adolescent Samples, According to Image Type

	Positive		Negative	
Sample	Valence	Arousal	Valence	Arousal
Hernandez et al. (2013) (*M* age = 13.79 years)	6.97	4.89	2.86	5.76
Vasa et al. (2011) (*M* age = 14.95 years)	7.45	5.11	3.22	5.95
Present study (age range = 16-18 years)	7.32	5.14	2.62	5.92

Note. M = mean; Valence = how positive image makes participants feel (higher score = more pleasant); Arousal = how cam/excited image makes participants feel (higher score = more excited).

The second stage of the design process contributed to the task's ecological validity, by adapting and modifying the IAPS images to align with real-life Facebook newsfeed content as closely as possible. First, all stimuli were situated on a white background and resized square column. Because many social media platforms (e.g., Facebook), posts contain a logo in the upper left corner to represent the source of the material, the second adaptation included the addition of a black circular 'logo', akin to that of many popular Facebook content publishers (e.g., 9GAG, UniLad, Ladbible). Third, non-functional 'play' and 'audio' buttons, response buttons (like, comment, share), view count, and time since posting (133K; 6 hours), were superimposed over the stimuli to simulate playable videos. Lastly, captions were added to 50% of the stimuli. Since no database of such material was available at the time of designing the study, such material was collected by analysing caption content from five of the most popular Facebook video publishers (as identified by digital news websites: 9GAG, Ladbible, UNILAD, VT and Buzzfeed). The 30 most recent generic captions (i.e., not specific to a particular person, topic etc.) were manually captured for each publisher. By identifying common themes across these 150 captions, 24 captions (12 positive, 12 negative) were generated and balanced for sentence length and structure (i.e., punctuation). Examples included: "A heart-warming video"; "So adorable…", "Inspiring" (for positive posts), and "A heart-wrenching video", "So sad..", "Horrific" (for negative posts). Captions contained a mixture of language devices (e.g., question marks, all in capitals, captions consisting of a single word). Posts could be classified as one of four categories depending on valence (positive or negative) and format (captioned or non-captioned). A small pilot study (N = 11) showed that 100% of participants correctly allocated posts to their intended 'negative' or 'positive' category.

The stimuli described above were presented to the participants as one continuous page (akin to a social media newsfeed). Participants were instructed to imagine they were scrolling through their personal social media newsfeed from top to bottom, at the pace they would normally use. The order of the 'posts' was randomised for each participant. On the next page, participants viewed the same 'newsfeed' again, but this time were asked to retrospectively rate each 'post' based on their initial viewing. The ratings took place during the second viewing to allow for uninterrupted, 'naturalistic', initial viewing. Due to the potentially distressing nature of the stimuli, participants could exit the social media task at any time by clicking a button, which re-directed them to the debrief page. For each post, participants answered three questions using a 7-point slider scale: 1) how the image made them feel (from 'negative' to 'positive'), 2) how likely they would have been to notice the post on their newsfeed (from 'not at all' to 'very much'), and 3) how likely they would have been to watch the video (from 'not at all' to 'very much'). Based on the responses to the three questions, summed scores were subsequently generated for the positive and negative stimulus categories: affectivity (from Question 1), attentional preference (from Question 2), and situation selection (Question 3). The term *attentional preference* was selected over *attentional bias*, as the variable was constructed from subjective (i.e., self-report) rather than objective means (i.e., eye-tracking). Scores from those three questions were used to calculate six indices (**Table O3**). These operationalisations map onto the conscious deliberate processes of Gross' model of ER (1998a), whereby affectivity and engagement are proxies for 'response modulation' strategies, and 'attentional preference' is a proxy for attentional allocation.

Table O2

Valence, Arousal, and Dominance Information for the IAPS Images Used to Develop Social Media Posts

				Valence		Arousal		Dominance	
Image	Description	Category	Assigned Caption	*M*	*SD*	*M*	*SD*	*M*	*SD*
1050	Snake	Negative	None	3.46	2.15	6.87	1.68	3.08	1.93
1201	Spider	Negative	None	3.55	1.88	6.36	2.11	3.87	2.30
2900	CryingBoy	Negative	So sad…	2.45	1.42	5.09	2.15	3.64	1.79
3100	BurnVictim	Negative	None	1.60	1.07	6.49	2.23	3.00	2.16
3170	BabyTumor	Negative	None	1.46	1.01	7.21	1.99	2.70	1.89
3181	BatteredFem	Negative	Is this the worst thing you've ever seen?	2.30	1.43	5.06	2.11	4.31	2.32
3550.1	PlaneCrash	Negative	None	2.35	1.39	6.29	1.96	3.47	2.10
4574	AttractiveMan	Negative	None	6.62	1.62	4.25	2.29	5.70	1.68
5970	Tornado	Negative	Bad news!	4.14	1.77	4.88	2.59	3.73	2.34
6020	ElectricChair	Negative	Guaranteed to make you feel terrible	3.41	1.98	5.58	2.01	4.07	2.43
6260	AimedGun	Negative	None	2.44	1.54	6.93	1.93	2.87	2.16
6415	DeadTiger	Negative	WARNING: Graphic content.	2.21	1.51	6.20	2.31	3.79	2.47
6550	Attack	Negative	This video is the most horrendous thing you will ever see.	2.73	2.38	7.09	1.98	3.01	2.41

7520	Hospital	Negative	None	3.83	1.56	4.57	1.85	4.42	1.82
9008	Needle	Negative	THIS LOOKS DISGUSTING!	3.47	1.85	4.45	2.10	5.30	2.21
9181	DeadCows	Negative	RIP.	2.26	1.85	5.39	2.41	4.04	2.27
9187	InjuredDog	Negative	A heart-wrenching video.	1.81	1.36	6.45	2.30	3.17	2.11
9301	Toilet	Negative	OMG! You won't be able to look away…	2.26	1.56	5.28	2.46	4.11	2.32
9413	Hanging	Negative	Truly horrific.	1.76	1.08	6.81	2.09	2.75	2.21
9480	Skull	Negative	Wow, this place is just shocking!	3.51	2.08	5.57	1.87	4.56	2.12
9592	Injection	Negative	None	3.34	1.75	5.23	2.09	4.14	2.28
9800	SkinHead	Negative	None	2.04	1.57	6.05	2.71	4.92	2.52
9810	KKKRally	Negative	None	2.09	1.78	6.62	2.26	3.95	2.50
9832	Cigarettes	Negative	None	2.94	1.58	4.46	2.06	5.53	2.51
9940	Explosion	Negative	None	1.62	1.20	7.15	2.24	2.45	2.22
1595	Pony	Positive	A heart-warming video.	6.22	1.64	4.79	2.09	5.54	1.96
1710	Puppies	Positive	None	8.34	1.12	5.41	2.34	6.55	1.98
1750	Bunnies	Positive	None	8.28	1.07	4.10	2.31	6.15	2.01
1920	Porpoise	Positive	LOL	7.90	1.48	4.27	2.53	6.50	2.18
2070	Baby	Positive	None	8.17	1.46	4.51	2.74	7.14	2.10
2155	Pregnant	Positive	Truly inspiring.	6.78	1.97	5.43	2.09	5.81	2.08

2332	Family	Positive	WARNING: Cuteness overload.	7.64	1.60	4.30	2.29	6.37	1.91
2347	Children	Positive	So adorable…	7.83	1.36	5.56	2.34	6.54	1.86
4619	Romance	Positive	This video is the most incredible thing you will ever see.	6.46	1.61	5.09	1.97	5.62	1.84
5301	Galaxy	Positive	Good news!	6.54	1.68	5.21	2.42	4.06	2.42
5621	SkyDivers	Positive	None	7.57	1.42	6.99	1.95	5.81	2.38
5825	Sea	Positive	Wow, this place is just beautiful!	8.03	1.18	5.46	2.72	6.61	2.11
7330	IceCream	Positive	THIS LOOKS AMAZING!	7.69	1.84	5.14	2.58	6.58	2.51
7410	Candy	Positive	None	6.91	1.56	4.55	2.24	5.92	2.10
7460	FrenchFries	Positive	None	6.81	2.08	5.12	2.49	5.78	2.26
7499	Concert	Positive	None	6.47	1.57	5.58	2.16	5.37	2.03
7502	Castle	Positive	None	7.75	1.40	5.91	2.31	6.64	2.19
7530	House	Positive	None	6.71	1.36	4.00	2.14	6.09	1.69
8162	HotAirBalloon	Positive	OMG! You'll want to watch this all day…	6.97	1.55	4.98	2.25	6.37	1.89
8461	HappyTeens	Positive	None	7.22	1.53	4.69	2.20	6.36	1.67
8470	Gymnast	Positive	Is this the best thing you've ever seen?	7.74	1.53	6.14	2.19	6.17	2.09
8501	Money	Positive	Guaranteed to make your day	7.91	1.66	6.44	2.29	6.05	2.52
8531	SportCar	Positive	None	7.03	1.50	5.41	2.15	6.77	1.69

Table O3

Indices Calculated from the Social Media Task

Variable	Index	Description	Calculation
[AF_POS]	Reactivity to positive posts	The extent to which participants reported positive posts as making them feel positive. A higher score represents experiencing a more positive response	[Sum (reactivity scores for positive posts)] / (Total number of positive posts rated)
[AF_NEG]	Reactivity to negative posts	The extent to which participants reported negative posts as making them feel negative. A lower score represents experiencing a more negative response.	[Sum (reactivity scores for negative posts)] / (Total number of negative posts rated)
[AT_POS]	Attentional preference for positive posts	The extent to which participants reported that they would notice positive posts on their social media newsfeed. A higher score represents greater preference.	[Sum (attentional preference scores for positive posts)] / (Total number of positive posts rated)
[AT_NEG]	Attentional preference for negative posts	The extent to which participants reported that they would notice negative posts on their social media newsfeed.	[Sum (attentional preference scores for negative posts)] / (Total number of negative posts rated)

		A higher score represents greater preference.	
[EN_POS]	Engagement with positive posts	The extent to which participants reported they would engage with positive posts. A higher score represents more engagement	[Sum (engagement scores for positive posts)] / (Total number of positive posts rated)
[EN_NEG]	Engagement with negative posts	The extent to which participants reported they would engage with negative posts. A higher score represents more engagement.	[Sum (engagement scores for negative posts)] / (Total number of negative posts rated)

Appendix P: Mediation Analyses

Model 1

Mediation Results for AEI Emotion Management and Happiness with 95% Confidence Intervals (N = 149)

Mediation results	Coefficient	LLCI	ULCI
Outcome: Reactivity to positive posts			
R = .53, *F* (15,149) = 3.42, *p* = .0001			
AEI (EM)	1.37	1.83	2.32
Sex	-.21	.42	.09
Openness	-.02	-.12	.08
Conscientiousness	-.08	-.23	.08
Extraversion	.07	-.06	.19
Agreeableness	.01	.-.12	.14
Neuroticism	.00	-.09	.09
Cognitive ability	.01	-.02	.03
Impulse control	.00	-.02	.02
Self-deceptive enhancement	.14	-.81	1.09
Impression management	-.06	-.24	.11
Baseline positive affect	.03	.01	.04
Baseline negative affect	-.02	-.04	.00
Social media use	.01	.00	.03
Outcome: Reactivity to negative posts			
R = .50, *F* (13,41) = 2.93, *p* = .0005			
AEI (EM)	-.78	2.24	4.92
Sex	.27	.03	.50
Openness	.01	-.07	.09
Conscientiousness	.03	-.09	.15
Extraversion	-.02	-.12	.09
Agreeableness	-.04	-.15	.07
Neuroticism	-.01	-.08	.06
Cognitive ability	-.01	-.03	.01
Impulse control	.00	-.01	.02
Self-deceptive enhancement	-.35	-1.11	.341
Impression management	-.01	-.15	.13
Baseline positive affect	.00	-.02	.02
Baseline negative affect	.00	-.02	.01
Social media use	.00	-.02	.01
Outcome: Happiness			
R = .76, *F* (13,41) = 10.51, *p* = .0000			
AEI (EM)	-2.14	-.36	4.49
Reactivity to positive posts	.26	-.02	.01

Reactivity to negative posts	-.02	-.30	.27
Sex	.16	-.22	.54
Openness	-.06	-.18	.07
Conscientiousness	.15	-.05	.034
Extraversion	.13	-.03	.29
Agreeableness	.18	.01	.36
Neuroticism	-.05	-.26	.06
Cognitive ability	.00	-.03	.03
Impulse control	.05	.02	.08
Self-deceptive enhancement	-.44	-1.64	.76
Impression management	-.13	-.34	.09
Baseline positive affect	.03	.01	.06
Baseline negative affect	-.03	-.05	-.01
Social media use	-.02	-.04	.01
Indirect effects:	Effect	BootLLCI	BootULCI
Reactivity to positive posts	.52	.13	1.06
Reactivity to negative posts	.05	-.16	.30
Direct effect	-2.14	-3.39	-.89

Note. AEI (EM) = Ability EI (emotion management); LLCI = Low Limit Confidence Interval; ULCI = Upper Limit Confidence Interval; BootLLCI = bootstrapped LLCI; bootULCI = bootstrapped ULCL.

Appendix P: Mediation Analyses

Model 2

Mediation Results for AEI Emotion Management and Happiness with 95% Confidence Intervals (N = 149)

Mediation results	Coefficient	LLCI	ULCI
Outcome: Reactivity to positive posts *R* = .53, *F* (15,149) = 3.42, *p* = .0001			
AEI (EM)	1.37	1.83	2.32
Sex	-.21	.42	.09
Openness	-.02	-.12	.08
Conscientiousness	-.08	-.23	.08
Extraversion	.07	-.06	.19
Agreeableness	.01	.-.12	.14
Neuroticism	.00	-.09	.09
Cognitive ability	.01	-.02	.03
Impulse control	.00	-.02	.02
Self-deceptive enhancement	.14	-.81	1.09
Impression management	-.06	-.24	.11
Baseline positive affect	.03	.01	.04
Baseline negative affect	-.02	-.04	.00
Social media use	.01	.00	.03
Outcome: Reactivity to negative posts *R* =N .50, *F* (13,41) = 2.93, *p* = .005			
AEI (EM)	-.78	2.24	4.92
Sex	.27	.03	.50
Openness	.01	-.07	.09
Conscientiousness	.03	-.09	.15
Extraversion	-.02	-.12	.09
Agreeableness	-.04	-.15	.07
Neuroticism	-.01	-.08	.06
Cognitive ability	-.01	-.03	.01
Impulse control	.00	-.01	.02
Self-deceptive enhancement	-.35	-1.11	.341
Impression management	-.01	-.15	.13
Baseline positive affect	.00	-.02	.02
Baseline negative affect	.00	-.02	.01
Social media use	.00	-.02	.01
Outcome: Life satisfaction *R* = .65, *F* (13,41) = 5.65, *p* = .0000			
AEI (EM)	-4.82	-12.16	2.50
Reactivity to positive posts			

Reactivity to negative posts			
Sex	.32	-1.93	2.57
Openness	-.87	-1.64	-.11
Conscientiousness	.41	-.73	1.55
Extraversion	.36	-.59	1.31
Agreeableness	.56	-.43	1.55
Neuroticism	-.22	-.87	.43
Cognitive ability	.05	-.14	.25
Impulse control	.21	.04	.39
Self-deceptive enhancement	-.89	-7.94	6.16
Impression management	-1.17	-2.47	.13
Baseline positive affect	.15	.03	.28
Baseline negative affect	-.19	-.34	-.03
Social media use	-.01	-.15	.14
Indirect effects:	Effect	BootLLCI	BootULCI
Reactivity to positive posts	1.98	2.51	5.50
Reactivity to negative posts	.98	.25	4.07
Direct effect	4.83	-12.17	2.50

Note. AEI (EM) = Ability EI (emotion management); LLCI = Low Limit Confidence Interval; ULCI = Upper Limit Confidence Interval; BootLLCI = bootstrapped LLCI; bootULCI = bootstrapped ULCL.

Appendix P: Mediation Analyses

Model 3

Mediation Results for AEI Emotion Perception and Happiness with 95% Confidence Intervals (N = 149)

Mediation results	Coefficient	LLCI	ULCI
Outcome: Reactivity to positive posts *R* = .48, *F* (15,149) = 2.64, *p* = .0016			
AEI (EP)	.00	-.01	.00
Sex	-.31	-.61	.00
Openness	-.02	-.12	.09
Conscientiousness	-.08	-.24	.08
Extraversion	.06	-.07	.19
Agreeableness	.04	-.10	.17
Neuroticism	.01	-.08	.10
Cognitive ability	.01	-.02	.04
Impulse control	.-1	-.01	.04
Self-deceptive enhancement	.08	-.90	1.05
Impression management	-.09	-.27	.09
Baseline positive affect	.03	.05	.00
Baseline negative affect	-.03	-.05	-.01
Social media use	.00	-.02	.02
Outcome: Reactivity to negative posts *R* = .53, *F* (13,41) = 3.39, *p* = .0001			
AEI (EP)	-.01	-.02	-.01
Sex	.27	.03	.50
Openness	.02	-.06	.11
Conscientiousness	.05	-.07	.17
Extraversion	-.01	-.11	.09
Agreeableness	-.03	-.13	.08
Neuroticism	-.01	-.07	.06
Cognitive ability	-.02	-.04	.00
Impulse control	.00	-.02	.01
Self-deceptive enhancement	-.41	=1.16	.34
Impression management	-.04	-.18	.10
Baseline positive affect	.00	-.02	.01
Baseline negative affect	.00	-.02	.01
Social media use	-.01	-.02	.01
Outcome: Happiness *R* = .74, *F* (13,41) = 9.30, *p* = .0000			
AEI (EP)	-.01	-.02	.01
Reactivity to positive posts	.26	-.02	.01

Reactivity to negative posts	-.02	-.30	.27
Sex	.16	-.22	.54
Openness	-.06	-.18	.07
Conscientiousness	.15	-.05	.034
Extraversion	.13	-.03	.29
Agreeableness	.18	.01	.36
Neuroticism	-.05	-.26	.06
Cognitive ability	.00	-.03	.03
Impulse control	.05	.02	.08
Self-deceptive enhancement	-.44	-1.64	.76
Impression management	-.13	-.34	.09
Baseline positive affect	.03	.01	.06
Baseline negative affect	-.03	-.05	-.01
Social media use	-.02	-.04	.01
Indirect effects:	Effect	BootLLCI	BootULCI
Reactivity to positive posts	.00	.00	.00
Reactivity to negative posts	.00	.00	.00
Direct effect	-.01	-.02	.01

Note. AEI (EM) = Ability EI (emotion management); LLCI = Low Limit Confidence Interval; ULCI = Upper Limit Confidence Interval; BootLLCI = bootstrapped LLCI; bootULCI = bootstrapped ULCL.

Appendix P: Mediation Analyses

Model 4

Mediation Results for AEI Emotion Perception and Life Satisfaction with 95% Confidence Intervals (N = 149)

Mediation results	Coefficient	LLCI	ULCI
Outcome: Reactivity to positive posts *R* = .48, *F* (15,149) = 2.64, *p* = .0016			
AEI (EP)	.00	-.01	.00
Sex	-.31	-.61	.00
Openness	-.02	-.12	.09
Conscientiousness	-.08	-.24	.08
Extraversion	.06	-.07	.19
Agreeableness	.04	-.10	.17
Neuroticism	.01	-.08	.10
Cognitive ability	.01	-.02	.04
Impulse control	.-.01	-.01	.04
Self-deceptive enhancement	.08	-.90	1.05
Impression management	-.09	-.27	.09
Baseline positive affect	.03	.05	.00
Baseline negative affect	-.03	-.05	-.01
Social media use	.00	-.02	.02
Outcome: Reactivity to negative posts *R* = .52, *F* (13,41) = 3.39, *p* = .0001			
AEI (EP)	-.01	-.02	-.01
Sex	.27	.03	.50
Openness	.02	-.06	.11
Conscientiousness	.05	-.07	.17
Extraversion	-.01	-.11	.09
Agreeableness	-.03	-.13	.08
Neuroticism	-.01	-.07	.06
Cognitive ability	-.02	-.04	.00
Impulse control	.00	-.02	.01
Self-deceptive enhancement	-.41	=1.16	.34
Impression management	-.04	-.18	.10
Baseline positive affect	.00	-.02	.01
Baseline negative affect	.00	-.02	.01
Social media use	-.01	-.02	.01
Outcome: Life satisfaction *R* = .65, *F* (13,41) = 5.49, *p* = .0000			
AEI (EP)	.01	-.06	.08
Reactivity to positive posts	1.17	-.08	2.43

Reactivity to negative posts	-.97	-2.60	.65
Sex	.32	-1.93	2.57
Openness	-.87	-1.64	-.11
Conscientiousness	.41	-.73	1.55
Extraversion	.36	-.59	1.31
Agreeableness	.56	-.43	1.55
Neuroticism	-.22	-.87	.43
Cognitive ability	.05	-.14	.25
Impulse control	.21	.04	.39
Self-deceptive enhancement	-.89	-7.94	6.16
Impression management	-1.17	-2.47	.13
Baseline positive affect	.15	.03	.28
Baseline negative affect	-.19	-.34	-.03
Social media use	-.01	-.15	.14
Indirect effects:	Effect	BootLLCI	BootULCI
Reactivity to positive posts	-.01	-.03	.01
Reactivity to negative posts	.01	-.01	.04
Direct effect	.01	-.01	.04

Note. AEI (EM) = Ability EI (emotion management); LLCI = Low Limit Confidence Interval; ULCI = Upper Limit Confidence Interval; BootLLCI = bootstrapped LLCI; bootULCI = bootstrapped ULCL.