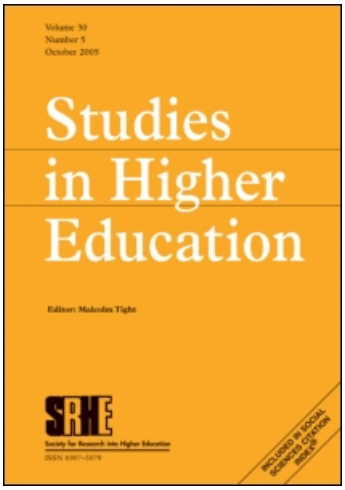

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Preferred 'learning styles' in students studying sports-related programmes in higher education in the United Kingdom

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This article investigates the 'preferred learning styles' and their relationship with grades for students undertaking sports-related undergraduate programmes at a higher education institution in the UK. Preferred 'learning styles' in students in this discipline have been identified as auditory, kinaesthetic and group, although the vast majority of students are multimodal in their learning preferences. Only individual learning style preference was found to be positively related to higher grade category, and group learning style preference was negatively related to grade category. The research aims to highlight the importance of a constructive alignment between sports learning activities and the learning styles of sports students, in order to enhance progression towards established sports learning outcomes. An issue of significance for the practitioner would be rebalancing learning and teaching methods to take cognisance of particular preferred learning styles, while still seeking to ensure that all learning styles are supported.

Introduction

It is a sign of the advances made in recent years that Shuell's challenging pronouncement 'that what the student does is actually more important in determining what is learned than what the teacher does' (1986, 429) is now regarded as axiomatic in much of higher education learning and teaching. This is underpinned by a constructivist paradigm which asserts that meaning is constructed by each learner (Piaget 1929; Dewey 1938), and then tested and honed by social interaction (Vygotsky 1978). Teaching then becomes a matter of providing appropriate frameworks, experiences and learning opportunities which allow the learner to construct and test understanding, knowledge and skills. This person-centred learning model (Rogers 1983), which emphasises the need to start with the student learner, can often feel at odds with the current drive in higher education systems, like that of the UK, to define practice in terms of achieving outputs, in the form of programme outcomes and subject benchmark statements (Quality Assurance Agency 2007). The concept of constructive alignment (Biggs 2003) has been proposed as a means of bridging this divide, by focusing the attention of teaching on the design of appropriate learning activities to develop students' understanding from the knowledge, skills, attitudes and approaches with which they enter higher education, through to the achievement of professional competences and capabilities defined in such benchmark statements. Central to the success of this venture is an understanding on the teacher's part of the learner's experience, including how the learner is approaching their learning and the learner's preferred learning style.

Learning style theory, with its origins in cognitive psychology, has been particularly influential in management development circles (Duff 2004). It is most commonly discussed currently in

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relation to the work of Kolb, whose conception of an experiential learning cycle (Kolb 1984), and related learning style inventory, provoked many and varied attempts to capture and describe learning styles (Dunn, Dunn, and Price 1987; Reid 1987; Honey and Mumford 1992; Fleming and Bonwell 1998). A learning style industry has grown up around these ideas offering a variety of commercial inventories, tools and measurement instruments, and policy makers are increasingly taking an interest in these ideas (Coffield et al. 2004). While the categories of learning style vary, from the activist, reflector, theorist and pragmatist of Honey and Mumford (1992), to the visual, aural, read/write and kinesthetic of VARK (Fleming and Bonwell 1998), the key underpinning assertion of many theorists is that such styles are personal attributes of the learner (Ramburuth 1997). Fleming suggests it is considerably easier to change learning and teaching strategy than to attempt to change the learner's learning preference, but does allow that individuals may change their learning preference with age or life experience (Fleming and Bonwell 1998). Kolb (1984) is willing to concede that an individual's learning style may develop, or at least vary, over time and that, at higher adult levels of learning, individuals can display 'adaptive flexibility' and apply the appropriate learning style to a given task (Kolb and Kolb 2005). There is also emerging evidence to suggest that learners may have preferred learning styles, yet apply others when constrained by the setting (Case and Marshall 2004). However, much of the work in this area seeks to categorise learners by their style and encourage them to undertake work or disciplinary study that best matches their preferred style. Yet there are important conceptual and pedagogic difficulties with the full adoption of such approaches, which 'promote a narrow view of matching teaching and learning styles that could be limiting rather than liberating' (Coffield et al. 2004, 3).

Coffield et al.'s (2004) important systematic review of the research literature on learning styles has indeed raised concerns over both the veracity of many learning style categorisations and the reliability and validity of many of the measurement instruments (though the review does not examine the instrument used in this study). While stopping well short of rejecting the concept of learning styles, Coffield et al. (2004) raise reasonable concerns over the unthinking use of learning styles to determine pedagogic practice, and call for more independent, large-scale, quasi-experimental research into learning styles. This rather unsurprising request from authors with a track record for large-scale positivist educational research is set against criticism of the 'mindless and atheoretical empiricism' of many small-scale local studies. Such a rejection of the value and rigour of much local practitioner research is unfortunate, and Coffield et al.'s (2004) views should not be taken to invalidate the conduct of local studies if they are designed, conducted and used thoughtfully to inform rather than dictate learning and teaching practices.

Previously published research has examined learning diversity in students from different countries studying at the same institution (Ramburuth and McCormick 2001) and across disciplines (Jones, Reichard, and Mokhtari 2003), and has demonstrated links between academic achievement and certain 'learning styles' (Diseth and Martinsen 2003; Mattick, Dennis, and Bligh 2004). With the increasing popularity of distance and e-learning programmes of study, and the placement of students in seemingly isolated learning environments, learning style research has identified specific needs in varying groups of students. Learning strategies have been investigated using interviews in order to assess their impact upon the development of support and guidance materials in distance learning in nursing disciplines (Carnwell 2000). Previous research with student nurses identified the importance of previous learning experiences, and the ability of students to adapt their learning style to the different subjects being studied, the nature of assessment (Sutcliffe 1993) and the role of assessment in shaping these approaches (Baumgart and Halse 1999).

Previous investigations have clearly identified that the elements of the learning environment that are under lecturer control 'can, and do, positively influence both the way students approach their study, and the learning outcomes they may achieve' (Lizzio, Wilson, and Simons 2002, 44;

Gibbs and Coffey 2004). Chio and Forde (2002) contend that the role, and effective identification, of learning styles in student groups therefore appears a potentially important element to the further understanding of the adoption of suitable teaching and learning methods. This can be particularly important in student groups comprising traditional and non-traditional backgrounds, varying entry qualifications, different prior educational experiences, different genders, different age groups and within specific discipline populations, where a diverse range of learning style preferences have been found to exist in the same classroom (Chio and Forde 2002).

Few recent investigations, however, have addressed the issues of preferred learning styles in sports-related disciplines such as sports studies, sports and exercise science, coaching science, sport and leisure management and outdoor recreation management. Indeed, research that has been published examining learning styles in sports-related programmes is either dated (Pettigrew and Zakrajsek 1984), focused solely on physical education (Coker 1997, 2000; Gong, Hu, and Lew 1997), or exhibits a considerable bias towards research in American institutions (Harrelson, Leaver-Dunn, and Wright 1998; Szucs, Hawden, and McGuire 2001).

The current research was designed to permit comparison of student responses from all levels of undergraduate degree and Higher National Diploma (HND, equivalent to the first two years of the degree) provision. It provides a cross-sectional perspective of 'preferred learning styles' evident at the disparate levels of progression through higher education in sports-related courses. Identification of 'learner styles' emerging from the research can inform teaching, learning and assessment strategies within the discipline. It is envisaged that greater awareness of sports student learning style preferences will allow more constructive alignment (Biggs 1999) of learning and teaching activities and methods with learning styles evident in this sample, and therefore enhance student progression towards autonomy and achievement.

The specific objectives of this research, therefore, were to:

(1) Identify and evaluate the 'preferred learning styles' of students in each of the three levels undertaking sports related undergraduate programmes at the higher education institution.
(2) Explore the relationships between 'preferred learning styles' and grade profiles in the students.

Method

The Perceptual Learning Style Preference Questionnaire (PLSPQ, Reid 1987) was administered to every student in each year of the sport-related programmes at a higher education institution in the UK. Responses were coded and entered into SPSS version 11.5.

The current grade profile for each student was calculated from the marks for the four modules undertaken in the same semester in which the research data were collected. The mean of these marks was calculated and categorised into the corresponding grade bands, according to the university marking and grading criteria.

Results

Questionnaires were completed and returned by 338 of the possible 450 students studying sports-related undergraduate course programmes, representing a return rate of 75%. The breakdown of gender and course representation can be seen in Table 1. The gender representation of the sample was, therefore, 68% men and 32% women, which was congruent with the current gender representation across the undergraduate sports programmes.

There was no significant age difference between males (mean 20.34yrs ±3.05) and females (mean 20.39yrs ±3.13; $t = 0.144$, $p = .89$). The entry route of the students was predominantly conventional, with 73% having A levels and 18% having undertaken recognised educational

Table 1. Participants by gender and course.

		Course Programme								
Gender	Year	UMS Sports Studies	UMS Sport & Exercise Science	UMS Sports Coaching Science	UMS Physical Education (non QTS)	HND Sports Studies	HND Sport & Leisure Management	HND Outdoor Recreation Management	UMS Outdoor Recreation Top-up	Total
Males	One	37	19	5	2	20	10	11	–	104
	Two	53	9	–	–	9	8	11	–	90
	Three	26	7	–	–	–	–	–	4	37
	Total	116	35	5	2	29	18	22	4	231
Females	One	14	4	1	0	3	3	5	–	30
	Two	30	14	–	–	6	2	3	–	55
	Three	14	8	–	–	–	–	–	0	22
	Total	58	26	1	0	9	5	8	0	107

UMS = Undergraduate Modular Scheme, HND = Higher National Diploma, – = not applicable as course not run in that year.

pre-higher education routes of the Business and Technology Education Council (BTEC) and General National Vocational Qualification (GNVQ) awards. Mature students made up 7% of the total sample, while 97% of the sample (only 246 students responded to this question) classified themselves as 'white', 2% as 'other' and 1% as 'black'. Mean grade calculations indicated that 4.8% of the students achieved grade E (fail); 23.9% D; 48.7% C; 20.7% B and 1.9% A.

Gender difference was reflected in the actual mean mark attained in the four modules completed that semester, and indicated that women attained significantly higher marks than the men in this sample (mean = 12.20±2.34 [grade category C], mean = 11.35±2.52 [grade category C minus] respectively, $p < 0.01$).

One-way ANOVA (analysis of variance) identified a significant difference in mean mark between the current year of study variable, with year three students attaining a significantly higher mean mark than year one students (mean = 12.37±2.42, mean = 11.29±2.55, F = 3.615, df 2, $p < .05$). There were no significant differences for mature student status, programme scheme (Undergraduate Modular Scheme [UMS] vs. HND), course programme or entry-level qualification ($p < .05$).

Instrument investigation

Perceptual Learning-Style Preference Questionnaire (PLSPQ) (Reid 1987)

The PLSPQ consists of 30 items, with six preferred learning styles (visual, auditory, kinaesthetic, tactile, group and individual) assessed using a total score from five items each. The items take the form of statements from which the respondent identifies whether they 'strongly disagree', 'disagree', were 'not sure', 'agree' or 'strongly agree'. Examples of items for each subscale included:

- Visual – 'When I read instructions, I remember them better';
- Auditory – 'When the lecturer tells me the instructions I understand better';
- Kinaesthetic – 'I prefer to learn by doing something in sessions';
- Tactile – 'I learn better when I make drawings as I study';
- Group – 'In sessions, I learn best when I work with others'; and
- Individual – 'When I study alone, I remember things better'.

Each item on the PLSPQ is coded from 0 (strongly disagree) to 4 (strongly agree), with the sum of the five items in each subscale then multiplied by two (Reid 1987). Preferred learning styles are then identified as 'negligible' (subscale total 0–14), 'minor' (subscale total 15–27) or 'major' (subscale total 28–40).

Before accepting the proposed subscales in the current sample, the 30 items of the PLSPQ were subjected to principal components analysis as recommended by Kember, Biggs, and Leung (2004). Prior to performing principal components analysis, the suitability of the data was confirmed using the Kaiser–Meyer–Olkin Measure of Sampling Adequacy (0.883, exceeding the recommended value of 0.6 [Kaiser 1974]), and the Bartlett's Test of Sphericity reached significance, supporting the factorability of the correlation matrix ($p < .001$).

Questions 6 (visual subscale item 'I learn better by reading what the lecturer writes on the dry-wipe board/PowerPoint') and 9 (auditory subscale item 'I remember things I have heard in sessions better than things I have read') were removed from subsequent analyses due to their disturbance of the factor identification. Principal component analysis (coefficients set at 0.4 [Ntoumanis 2001]) in effect identified five subscales, with the group and individual subscales loading as positive and negative items on the same factor (component 1, Table 2).

The five components loaded with eigenvalues exceeding 1, explained 27.4, 11.4, 7.2, 6.1, and 4.6% of the variance, respectively. Varimax rotation was performed and identified the five

Table 2. Principal components analysis: varimax rotation of five-factor solution for PLSP questionnaire.

	Rotated Component Matrix				
	Component				
	1: Group & Individual	2: Tactile	3: Kinaesthetic	4: Visual	5: Auditory
P23	.815				
P30	–.810				
P4	.798				
P3	.790				
P27	–.787				
P18	–.762				
P28	–.759				
P5	.755				
P13	–.710				
P21	.684				
P22		.789			
P25		.769			
P11		.715			
P14		.703			
P16		.640			
P2			.738		
P8			.713		
P26			.573		
P15			.528		
P19			.397		
P10				.755	
P12				.691	
P24				.686	
P29				.566	
P20					.720
P7					.657
P17					.637
P1					.455

Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser Normalization. Rotation converged in 6 iterations.

components as component 1: Group (positive) and Individual (negative), 2: Tactile, 3: Kinesthetic, 4: Visual and 5: Auditory. The five-factor solution explained a total of 56.5% of the variance, with component 1 contributing 22.47%, component 2 11.15%, component 3 8.49%, component 4 8.05% and component 5 6.41%. These results, therefore, support the use of the subscales of the questionnaire, after removal of questions p6 and p9, in this cohort of students studying sports-related courses. The remaining analyses therefore utilised the modified four-item Auditory (questions 1, 7, 17, 20) and Visual (questions 10, 12, 24, 29) subscales.

Reliability analysis statistics were also performed in order to measure the internal consistency of the six subscales of the questionnaire. The results for the Cronbach's alpha coefficient (α) for each subscale demonstrated good internal consistency (Tactile $\alpha = 0.80$, Group $\alpha = 0.91$,

Kinaesthetic $\alpha = 0.72$, Individual $\alpha = 0.90$) except for the revised Auditory ($\alpha = 0.53$ from original $\alpha = 0.53$) and the revised Visual ($\alpha = 0.68$ from original $\alpha = 0.66$) subscales.

Data analysis

Perceptual Learning Styles Preference Questionnaire

The subscales used for the following analyses were those determined by the original questionnaire except for the revised four-item Auditory and Visual subscales. The mean of the four remaining items was used as the fifth item in both of these subscales so that comparisons could be made between the totals of the revised 4-item subscales and the categories of the 5-item subscales proposed by the original instrument, i.e. 'negligible' (subscale total 0–14), 'minor' (subscale total 15–27) and 'major' (subscale total 28–40).

From Table 3 it is apparent that the major perceptual learning styles in the sample were auditory (54%), kinaesthetic (50%), group (46%), individual (37%), tactile (21%) and visual (20%).

Chi-square analyses determined that the category frequencies for each of the learning styles were significantly different from those expected ($p < .001$). Spearman's rank order correlation coefficients identified a large, negative, significant correlation between individual and group learning style preference categories; a medium, positive, significant correlation between tactile and kinaesthetic learning style preference categories; a medium, positive, significant correlation between visual and individual learning style preference categories; a small, positive, significant correlation between group and kinaesthetic learning style preference categories; and small, negative, significant correlations between visual and group, individual and kinaesthetic, tactile and group, and kinaesthetic and visual learning style preference categories (Table 4).

Students exhibited multiple major preferred learning styles, with 6% of the sample not exhibiting a major preference category in any of the six learning styles, 22% exhibiting one only, 36% two and 36% three or more. Spearman rank order correlation between grade category achieved and number of major learning style preferences identified no significant relationship between the two variables ($p > .05$).

Table 3. Percentage representation in preferred learning style categories.

	Negligible	Minor	Major
Auditory	1	45	54
Kinaesthetic	5	45	50
Group	20	34	46
Individual	24	39	37
Tactile	19	59	21
Visual	15	65	20

Table 4. Spearman's rank order correlation coefficients between learning style categories.

	Auditory	Visual	Individual	Tactile	Group
Visual	0.096	–	–	–	–
Individual	0.079	0.330**	–	–	–
Tactile	–0.096	–0.101	–0.101	–	–
Group	–0.042	–0.199**	–0.643**	0.181**	–
Kinaesthetic	–0.038	–0.156**	–0.186**	0.345**	0.270**

$p < .01$, $^{**}p < .001$.

Table 5. Kruskal–Wallis tests for learning preference categories across the three year groups.

	Learning style					
	Auditory (revised subscale)	Visual (revised subscale)	Tactile	Group	Kinaesthetic	Individual
Chi-square	7.328	.438	2.171	.728	3.611	.630
Df	2	2	2	2	2	2
p	.026	.803	.338	.695	.164	.730

Non-parametric Mann–Whitney U tests indicated that there were no significant differences between men and women students, or between 'mature' and 'non-mature' students for learning preference category in any of the learning styles ($p > .05$).

Non-parametric Kruskal–Wallis tests (Table 5) indicated that a significant difference in learning preference categories across the three year-groups was apparent for the 'Auditory' learning style, with year three students demonstrating a significantly higher preference for the auditory learning style (year one mean rank 86.41; year three mean rank 106.41; U = 2805, $p < .02$ [signifiance level determined by $p = .05$ divided by number of Mann–Whitney U tests performed, according to Ntoumanis 2004]).

Non-parametric Kruskal–Wallis tests indicated that there was a significant difference in learning preference categories across the course programmes for the 'Auditory' and 'Tactile' learning styles ($p < .01$ and $p < .05$, respectively), with UMS Sports Studies students and UMS Sport and Exercise Science students having significantly greater auditory preference categories than the HND outdoor recreation management students, and UMS Sports Studies students having significantly lower tactile preference category than the HND outdoor recreation management students.

Non-parametric Mann–Whitney U tests indicated that there were significant differences between Undergraduate Modular Scheme and Higher National Diploma programmes for learning preference categories for 'Auditory' ($p < .001$) and 'Tactile' learning styles ($p < .05$), with the UMS students more auditory and the HND more tactile in learning style preference category.

The mean mark for the four modules taken in the semester in which the research was undertaken was calculated and expressed as a grade category, based on the mark scheme used at the higher education institution (0–7.49 = Fail; 7.5–10.49 = D, 10.5–13.49 = C; 13.5–16.49 = B; 16.5–19 = A). Spearman's rank order correlation coefficient was then calculated between each of the learning style preference categories and grade category (Table 6). It was evident that there was a small positive significant correlation between individual learning style category and grade

Table 6. Correlation between preferred learning style category and grade category achieved.

Preferred learning style (categories)	Correlation coefficient	Sig. (two-tailed)
Visual	0.102	NS
Auditory	0.048	NS
Individual	0.247	$p < .001$
Kinaesthetic	0.075	NS
Group	–0.178	$p < .01$
Tactile	0.025	NS

category, and a small negative significant correlation between learning style category and grade category.

Discussion

These data represent the first collection and analysis of discipline-specific data regarding 'learning styles' in a large representative cohort of students studying a range of sportrelated programmes in higher education in the UK. As such, they attempt to begin to redress the paucity of research data available from this specific group of students and courses in an increasingly popular area of academic study (Learning and Teaching Support Network 2002).

Investigation of entry qualifications for the sample demonstrated that, whilst the majority of students (77%) entered through the conventional route from A levels, 23% did not. Mature students represented only 7% of the cohort, and there was a limited spread of ethnicity. These figures suggest that the student group was not, therefore, particularly diverse in terms of basic social and educational background.

The Perceptual Learning Style Preference Questionnaire was found to be valid and reliable in this sample, with the six subscales clearly identifiable by principal components analysis, and supported by internal consistency statistics with the deletion of only two items. Although the six subscales did not load onto separate factors, the five-factor model clearly identified factor one as both the group (positive) and individual (negative) subscales, and was deemed as acceptable for this study.

The learning styles preferred by the sample appeared to be the auditory, kinaesthetic and group learning styles, with no significant gender or maturity status differences apparent. This may reflect students self-selecting on the basis of expectation of how sports learning takes place in higher education, or being selected by the educational process into a subject which suits their learning style. The nature of the current sports course, with large amounts of the course programmes taught through practical, kinaesthetic, experiential learning certainly aligns with these learning styles, and it is noticeable that sports students encounter more problems with those elements of the curriculum that are more theoretical in nature and that tend to be taught more conventionally. Efforts could be made to support student learning of challenging theoretical material through application and engagement in learning activities better aligned with these preferences.

Having said this, the majority of the students (94%) demonstrated the use of more than one major preferred learning style, and were therefore identified as multimodal (Reid 1987), with the remaining 6% actually non-identifiable in terms of their learning style preference. There was no significant difference in actual grade between students demonstrating different numbers of major learning style preferences, i.e. neither single nor multimodal students achieved more successfully. Significant relationships between the preferred learning styles were apparent, again supporting the interdependence of the styles in the sample and the multimodal nature of the sample. Further research may be required to identify if the multimodal representation in the sample is a reflection of co-existence, or whether different preferred learning styles are utilised strategically to align with the requirements of assessment, as has been observed in approaches to study research (Richardson 1994).

A significant difference in preferred learning styles was found between year three and year one for the auditory learning style, with the year three group demonstrating significantly greater preference for the auditory category. This would again appear to be congruent with the definition of the auditory learning style, including the ability to learn from class discussion and conversing with tutors, with the provision of these opportunities through decreased class numbers, increased engagement in discussion, reduced number of assessment items per module

and no time-constrained examinations at level three appearing to be facilitating metacognitive development towards autonomy (Case and Gunstone 2002; Diseth and Martinsen 2003). With the rather encompassing 'definition' of auditory style, however, it may also be contested that the third-year students have learnt, changed or adapted to this preferred style of learning, due to the predominantly auditory delivery of the majority of sessions/modules. This causal relationship cannot, however, be addressed from analysis of the cross-sectional data in the current study.

Difference in learning style across the course programmes was observed, primarily in relation to the HND Outdoor Recreation Management group and the UMS Sports Studies and Sport and Exercise Science students. The outdoor recreation students were more tactile and less auditory. This again may be explained by the nature of their course, which focuses heavily on performance and practical skills within a 'competency-based' curriculum. Again, the more practical nature of outdoor recreation compared to sport and exercise science, and of the HND compared to undergraduate study, suggests that there may be some form of selection of subject and study to match learning style, either by the student or by the way the educational system works on the students.

Grade category was weakly correlated with individual learning style (positive) and group learning style (negative). Although the relationships were weak, it could be argued that this does not demonstrate alignment, in that the students generally prefer group learning yet individual learning is what is achieving higher grades. Are our systems rewarding an individual approach and, if so, is this because sports academics seek to value this, because it is considered important in the discipline, or because of extraneous factors? Learning and teaching methods have moved towards greater use of group learning, but assessment is still largely undertaken individually. Perhaps greater use of group assessment, where appropriate, should be considered. Conversely, if an individual learning style is achieving better results, should learning and teaching approaches be encouraging more sports students to adopt it? The results may indicate that the students who are attracted to the group-learning environment and develop, or who have already developed, the group learning style preference, do so as they are allowed to take advantage of the opportunity to 'social loaf' (i.e. apply less individual effort: Latane, Williams, and Harkins 1979). Individual learning style preference students would, anecdotally, prefer not to undertake group work, as they perceive the group environment as a development of their own abilities between less able students.

Whilst many modules utilise diverse practical assessment methods, such as practical laboratory and field based assessment, coaching sessions and practical personal performance, there is still the requirement in all of the modules for the submission of written work, either through essays, laboratory reports, reflections, personal reflective logs, open book examinations or, occasionally, timed examinations. There would, therefore, appear to be some argument for constructive realignment of the assessment strategy towards practical, hands-on methods for the achievement of programme learning outcomes where possible, in order to build upon the learning strengths of the student population. In parallel, explicit work on enhancing the ability of the student to convey practically attained deep learning via conventional academic written and oral communication may prove beneficial in those areas of the curriculum where such communication is deemed central. Evidence is not available from this research as to whether the learning styles evident in the sample are caused by individual choice, current and previous educational and learning environment, strategic approaches to achievement, or indeed a combination of these.

Conclusions

The specific objectives of this research were to identify and evaluate the 'preferred learning styles' of students at each of three levels undertaking sports-related undergraduate programmes, and to explore the relationships between 'learning styles' and grade profiles of students in each of the three levels.

The preferred 'learning styles' in students in this discipline have been identified as auditory, kinaesthetic and group, although the vast majority of students are multimodal in their learning preferences. Only individual learning style preference was positively related to higher grade category, while group learning style preference was negatively related to grade category.

Regardless of the findings of this study, it is not simple to read off possible changes in teaching methods and learning environment that could or should be made in response. If learning styles are seen largely as personal attributes of the learner, it would seem that the best response would be to tailor sports learning activities to best fit the learning styles of sports students. Yet, although the leanings of these sports students towards particular learning styles is noticeable, there are still indications of a reasonable spread of styles, of students combining styles, and, possibly, of students adapting their style in the light of their undergraduate experience. It might, then, be a matter of rebalancing learning opportunities to emphasise particular learning styles, while still seeking to ensure that all learning styles are supported. Of course, if learning styles can be addressed and developed, then higher education sport learning and teaching might wish to seek to develop the learning styles of students in which they have been identified to be weak. Finally, there is some indication that the emphasis on particular learning styles already exhibited by this, and other, sports programmes might already be inclining certain types of learner to undertake higher education sports study. In this case, it is worth considering whether student expectations about the learning styles that will be appropriate for higher education sports learning are well founded, and what steps higher education sports tutors might wish to take to ensure that they support students through to the achievement of the required capabilities and outcomes through utilising or addressing these learning styles. This research provides information that can inform this debate and help in the construction of a learning and teaching strategy which is cognisant of sports students' preferred learning styles.

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