EXERCISE PSYCHOLOGY

Young People's Motivational Profiles
in Physical Activity: A Cluster Analysis

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A great deal has been written about the motivation of young people in physical activity, and the determinants of activity for this age group have been identified as a research priority. Despite this, there are few large-scale studies identifying "types" or "clusters" of young people based on their scores on validated motivation inventories. This study reports the results of a cluster analysis of a large national sample ($n = 2,510$) of 12- to 15-year-olds using contemporary approaches to physical activity motivation: achievement goal orientations, self-determination theory (including amotivation), the nature of athletic ability beliefs, and perceived competence. Five meaningful clusters were identified reflecting two highly motivated and two less well-motivated clusters, as well as a clearly amotivated cluster. Groupings were validated by investigating differences in physical activity participation and perceptions of physical self-worth. Some clusters reflected age and gender differences. The results provide valuable information for likely strategies to promote physical activity in young people.

Key words: exercise, health, children

Physical activity in youth is an important public health issue, and regular participation in physical activity for young people can enhance their physical, psychological, and social well-being (for reviews see Biddle, Sallis, & Cavill, 1998). In addition, there is public concern about the apparent decline in activity in youth. While this is unsubstantiated by evidence from the 1990s (Pratt, Macera, & Blanton, 1999), there is other evidence showing increases in obesity (Fehily, 1999), coupled with the view that youth are more sedentary as new technologies become more widely available. All this suggests the need for further study of youth physical activity. Indeed, national campaigns are now highlighting inactivity in youth as a public health problem (British Heart Foundation, 2000) and the media report such issues with regularity. These concerns point to the importance of understanding the motivational factors associated with physical activity in youth.

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Recent research evidence reveals a decline in participation in physical activity in young people across their teenage years. This decline is particularly obvious in girls and is steeper in adolescence than in childhood (Pratt et al., 1999). Therefore it is important to examine the factors that influence young people's likelihood of being physically active, including gender and age differences, and this has been identified as a research priority (Sallis et al., 1992).

The literature on the determinants of physical activity in youth has highlighted a wide range of potentially influential factors. For example, Sallis, Prochaska, and Taylor (2000) reviewed 54 studies investigating correlates of physical activity in adolescents and identified 48 factors including demographic, biological, psychological, behavioral, social and cultural, and physical environmental variables. Of 17 psychological constructs, only achievement orientation (+), perceived competence (+), intention (+), and depression (–) were consistently associated with physical activity. However, the lack of consistency in methods, particularly measurement, is a problem in this field.

The review by Sallis et al. (2000) suggests that motivational variables centered on achievement orientation and perceptions of competence are worthy of study. Indeed, the sport and exercise psychology literature over the past decade or so has shown that such constructs are popular (Biddle, 1997b), with numerous studies of achievement goal orientations (Duda, Fox, Biddle, & Armstrong, 1992; Hall, Kerr, & Matthews, 1998; Harwood & Swain, 1998; Papaioannou, 1995a) and associated belief structures (Biddle, Soos, & Chatzisarantis, 1999a; Lintunen, Valkonen, Leskinen, & Biddle, 1999), motivational climate (Ntoumanis & Biddle, 1999a), perceptions of competence (Weiss, Ebbeck, & Horn, 1997), and perceptions of autonomy, self-determination, and intrinsic motivational processes (Brunel, 1999; Chatzisarantis, Biddle, & Meek, 1997). However, while studies have often investigated motivational constructs in isolation, little is known about the individual differences in patterns of key motivational indicators when looking across a comprehensive profile of scores.

The extent to which these motivational constructs are interrelated, therefore, is not well understood and some have called for more consideration of conceptual convergence (Biddle, 1999). Identifying subgroups of young people who represent different combinations or patterns based on these contemporary indicators of motivation might prove instructive. In this way, homogenous groups may be located and segmentation strategies could be developed to increase the effectiveness of interventions to promote physical activity in young people.

This is consistent with the 5-phase behavioral epidemiological framework outlined by Sallis and Owen (1999). Phase 1 is to establish the links between physical activity and health while Phase 2 is to develop methods for accurately measuring physical activity. Phase 3 is to identify factors that influence the level of physical activity, and clearly this is what "determinants" research has been attempting for the past decade or so. Phase 4 is to evaluate the effectiveness of interventions to promote physical activity. It is our contention that interventions will be more effective when we have information on the different target groups we might be trying to change (Donovan & Owen, 1994; Killoran, Cavill, & Walker, 1994). Finally, Phase 5 is to translate research into practice.

Motivation Theories

Goal Perspectives Theory

Research on the motivation of children and youth in physical activity has shown the importance of how young people define success (for reviews see Papaioannou, 1995b; Roberts, 1993; Treasure & Roberts, 1995). Research has identified two perspectives that are reflected in two major achievement goal orientations, namely, task and ego goals. A task-oriented person is more likely to define success or construe competence in terms of mastery or task improvement. He or she tends to adopt personal criteria of evaluation. An ego-oriented person is more likely to define success or construe competence in normative terms, such as through winning or outperforming others.

In sport and physical education, task orientation has been found to be positively associated with various indicators of motivation, including intrinsic motivation (Duda, Chi, Newton, Walling, & Catley, 1995; Goudas, Biddle, & Fox, 1994) and positive affect (Ntoumanis & Biddle, 1999b). The relationship between ego orientation and motivational indictors is less clear (J. Whitehead, 1995), although when combined with a high task orientation, motivation is often high (Fox, Goudas, Biddle, Duda, & Armstrong, 1994). Some researchers have shown that motivation will be high for ego oriented individuals only when perceived competence is high (Cury, Biddle, Sarrazin, & Famose, 1997), as predicted in goal perspectives theory (Nicholls, 1989), while others have shown no such effects (Vlachopoulos & Biddle, 1997).

Self-Theories of Ability Beliefs

Young people who differ in goal orientations have been shown to differ in how they view effort and ability as causes of success (Duda et al., 1992). In addition, classroom research has shown children to process ability-related information in different ways. For example, Dweck and colleagues have discussed conceptions of ability in terms of beliefs about the nature of intelligence, morality, and stereotyping (Dweck, 1999; Dweck, Chiu, & Hong, 1995; Dweck & Leggett, 1988). They distinguish between intelligence that is thought by some to be relatively fixed and intelligence thought to be changeable. Children believing in a more fixed notion of intelligence (an "entity theory" of intelligence) were more likely to adopt an ego-oriented achievement goal and showed less adaptive responses to failure (Mueller & Dweck, 1998). Conversely, children believing that intelligence is changeable (an "incremental theory" of intelligence) were more likely to adopt a task-oriented goal and show positive motivation (Hong, Chiu, Dweck, Lin, & Wan, 1999).

Support for such propositions is now emerging in physical activity. Jourden, Bandura, and Banfield (1991) provide evidence that motor performance is more positively affected by conceptions of ability associated with acquirable skill than ability viewed as inherent aptitude. Biddle et al. (1999a) tested a model predicting intentions from perceived competence, achievement goals, and ability beliefs in Hungarian youths. They found that entity beliefs predicted an ego goal orientation whereas incremental beliefs predicted a task orientation. In addition, behavioral intentions were predicted by a task, but not an ego, goal orientation. It appears,

therefore, that testing the way young people construe the nature of sport ability, either singly or in combination with goal orientations, might be important.

Self-Determination Theory

So far we have argued that assessing whether young people define success in task or ego terms, and how they construe the nature of sport ability, sheds light on physical activity motivation. However, both constructs consider motivation from the more narrowly defined point of view of achievement beliefs assessed at the contextual level (Vallerand, 1997). Goals provide information about how young people think about success in the context of physical activity, and self-theories of ability inform us about the way people view the nature of ability in relation to success on such tasks. Although both have been shown to be associated with motivated behavior, neither addresses behavioral tendencies beyond the confines of achievement or ability.

Self-determination theory (SDT) is an organismic theory of motivation that accounts for psychological needs and motives and provides a wide theory of motivated behavior (Deci & Ryan, 1985, 1991; Ryan & Connell, 1989; Ryan & Deci, 2000a, 2000b). The psychological needs include those of autonomy, competence, and relatedness (social needs). The need for autonomy is defined as the need to feel ownership of one's behavior. The need for competence is the need for producing desired outcomes and to experience mastery and effectiveness, while the need for relatedness is the need to feel that one can relate to others and with society in general (Deci, Eghrari, Patrick, & Leone, 1994).

People are motivated to satisfy these needs, which are considered essential for the development of the self. When autonomous, people experience choice and freedom in their actions, as characterized by an absence of external pressures. On the other hand, when a person is compelled to do certain things (i.e., when the behavior is not self-determined), he or she has the feeling of being controlled. Building on Cognitive Evaluation Theory, it has been shown that intrinsic motivation will increase under conditions of autonomous competence (Deci, Koestner, & Ryan, 1999; Ryan & Deci, 2000b).

There are different types of behavioral regulations central to self-determination theory, each one reflecting a qualitatively different reason for the behavior in question. In addition to intrinsic motivation, there are four types of extrinsic motivation: external, introjected, identified, and integrated forms of regulation. The latter is developmentally less appropriate for young people and few studies of this age group have assessed integrated regulation (Vallerand & Fortier, 1998).

External regulation refers to behavior that is controlled by external means, such as rewards or external authority. Introjected regulation refers to behavior that is self-imposed, such as guilt avoidance, and is characterized by feelings of internalized pressure such as "I ought to...." In identified regulation, the behavior is self-determined according to one's choice or values. It is characterized by feelings of "want" rather than "ought." Finally, intrinsically motivated behavior is done solely for its own sake or enjoyment. These four behavioral regulations can be assessed by using the Perceived Locus of Causality scale (PLOC) developed by Ryan and Connell (1989), or other variations (Mullan, Markland, & Ingledew, 1997; Pelletier et al., 1995).

The four regulations form a continuum that characterizes the degree of internalization of the behavior. This is indicated by the Relative Autonomy Index (RAI) calculated by weighting and summing each subscale. Positive scores indicate more autonomous regulation while negative scores indicate more controlling regulation. Research has shown the motivational benefits of more self-determined behavioral regulation in physical activity contexts with adults (Chatzisarantis & Biddle, 1998; Mullan & Markland, 1997) and youth (Biddle, Soos, & Chatzisarantis, 1999b; Chatzisarantis et al., 1997).

Amotivation

Another important concept in the study of motivation in physical activity, but one that has not been studied extensively, is amotivation. Although it can fit within a self-determination theory framework (Ryan & Deci, 2000b), it is an important variable in its own right. Amotivation refers to lack of motivation where no contingency between actions and outcomes is perceived and there is no perceived purpose in engaging in the activity (Deci & Ryan, 1985; Ryan & Deci, 2000b; Vallerand & Fortier, 1998). This perception of uncontrollability and lack of competence is what Deci and Ryan (1985) refer to as amotivation at the "external boundary" of PLOC – "the boundary between the person and forces in the world" (p. 150). Sometimes it is seen as similar to feelings of helplessness. Vallerand and Fortier (1998) suggest that the study of amotivation "may prove helpful in predicting lack of persistence in sport and physical activity" (p. 85).

Perceived Competence

Competence-based motivational theories dominate the literature (Biddle, 1997a). We have already considered the role of perceived competence in goal orientations theory. In addition, entity beliefs are most likely to be motivationally maladaptive in conditions of failure, or when perceived competence is low. Moreover, perceptions of competence and autonomy are central to self-determination theory predictions. Any motivational profile should include such a measure of how young people perceive their competence.

Physical Self-Worth

Physical self-perceptions have been shown to be important indicators of motivation and psychological well-being (Fox, 1997a, 1997b). For example, in a study of young people, J.R. Whitehead (1995) found that perceptions of physical self-worth were highly correlated with global self-esteem in both boys and girls. Having a positive physical self-perception was associated with a positive perception of body attractiveness, sport competence, strength, and physical condition. This suggests that physical self-worth might be an important marker of participation in physical activity in young people.

Summary and Purpose of the Study

In summary, we assume that there are variations in individuals in terms of achievement goal orientations, conceptions of the nature of sport ability, self-determination (RAI), amotivation, and perceived competence. Many investigations

have studied such constructs in isolation, or merely compared one construct with another. We argue that while each one presents a distinct way of viewing motivation, a more complete picture will be obtained by studying the variables in combination. The purpose of this study, therefore, was to identify subgroups of young people with distinctive motivational profiles based on these important and contemporary indictors of motivation. In addition, we examined the variations in physical activity participation and perceived physical self-worth (PSW) in the different subgroups identified as a form of validation for any groups that emerge.

Method

Participants

The study initially involved 2,969 students from 49 schools in England. After deletion for missing data and outliers (see Results), the final sample comprised 2,510 participants (1,332 girls; 1,178 boys). The students were 11 to 15 years of age ($M = 12.95$, $SD = 0.90$) and were in Grades 7 ($n = 760$), 8 ($n = 841$), and 9 ($n = 909$). They represented diverse socioeconomic backgrounds and all geographical regions of England. Students were randomly sampled within age and gender groups from schools recruited to take part in a larger project concerning curriculum change in physical education. Normal informed consent and ethical procedures were followed and conformed to guidelines of the British Psychological Society.

Measures

In assessing the motivational constructs reviewed, validated instruments were chosen. Nevertheless, psychometric tests of all inventories were also conducted. For the sake of brevity, only summary statistics on psychometrics will be presented. Full psychometric details are available from the corresponding author.

Achievement Goal Orientations. Students' dispositional goal orientations were assessed with the established English (UK) version of the Task and Ego Orientation in Sport Questionnaire (TEOSQ; Duda & Whitehead, 1998). The stem for the 13 items was "I feel most successful in sport and physical education when...." and assessed task (e.g., "... I do my very best") and ego (e.g., "... I am the best") goals. Answers were given on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). A 2-factor structure was confirmed using confirmatory factor analysis, and satisfactory internal consistency coefficients using Cronbach's (1951) alpha were found (see Table 1).

Sport Ability Beliefs. The English version of the Conceptions of the Nature of Athletic Ability Questionnaire, Version 2 (CNAAQ-2; Biddle, Wang, Chatzisarantis, & Spray, 2000) was employed to examine incremental and entity beliefs. Incremental beliefs were assessed through the two subscales reflecting Learning (3 items, e.g., "to be successful in sport you need to learn techniques and skills, and practice them regularly") and Improvement (3 items, e.g., "how good you are at sport will always improve if you work at it"). Entity beliefs were measured through two subscales reflecting Stable (3 items, e.g., "it is difficult to change how good you are in sport") and Gift (3 items, e.g., "to be good in sport you need to be naturally gifted"). Responses were made on 5-point scales, similar to the

Table 1 Descriptive Statistics and Internal Consistency Coefficients for Overall Sample

Variables	α	Overall means	SD
1. Task	.76	4.05	.51
2. Ego	.83	2.71	.84
3. Incremental	.75	4.17	.55
4. Entity	.70	2.38	.64
5. External regulation	.80	2.25	.89
6. Introjection	.64	2.75	.77
7. Identification	.72	4.10	.71
8. Intrinsic motivation	.82	4.17	.77
9. Perceived competence	.80	2.75	.59
10. RAI	—	5.18	3.36
11. Amotivation	.70	1.85	.76
12. Physical self-worth	.86	2.79	.62
13. Physical activity	—	2.35	.66

TEOSQ. The scale was developed from that used by Sarrazin et al. (1996) and Biddle et al. (1999a), and analysis of the current sample showed good factorial validity using CFA and satisfactory internal consistency (see Table 1).

Relative Autonomy Index (RAI).   The Perceived Locus of Causality (PLOC) scale developed by Goudas et al. (1994) was used to assess four types of behavioral regulation in the PE/sport context. The stem for all items was "I take part in PE and sport. ..." External regulation (e.g., "because I'll get into trouble if I don't") and introjection (e.g., "because I'll feel bad about myself if I didn't") were assessed through four items each. Identification (e.g., "because it is important for me to do well in sport/PE") and intrinsic motivation (e.g., "because sport/PE is fun") were measured through three items each. Psychometric assessment of the scale showed good factorial validity and satisfactory internal consistency (see Table 1).

An overall relative autonomy index (RAI) was calculated by weighting each subscale to indicate the level of autonomy in the following way: external regulation x (−2) + introjection x (−1) + identification x (1) + intrinsic motivation x (2). This serves as an indicator of a person's motivational orientation, with positive scores indicating more autonomous regulation and negative scores indicating more controlling regulation.

Amotivation.   Amotivation was assessed by three items modified by Goudas et al. (1994) from the Academic Motivation Scale (Vallerand et al., 1992, 1993). The stem for the items was "I take part in physical education and sport...." The three items are: "...but I really don't know why," "...but I don't see why we should have sport/PE," and "...but I really feel I'm wasting my time in sport/PE." A satisfactory internal consistency coefficient was obtained (see Table 1). Answers were given on a 5–point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Perceived Competence and Physical Self-Worth (PSW).   The Sport Competence and PSW items from the children's version of the Physical Self-Perception

Profile (PSPP-C) (J.R. Whitehead, 1995) were administered. This scale adopts a structured alternative format whereby participants chose one of two statements that best describe them and then rate whether it is "sort of true for me" or "really true for me." This produces a 4-point scale. Six items assessed perceived competence (e.g., "some kids do very well at all kinds of sports" [positive pole]). PSW reflects "general feelings of happiness, satisfaction, pride, respect, and confidence in the physical self" (Fox, 1990, p. 6) and is assessed with six items (e.g., "some kids are proud of themselves physically" [positive pole]).

Physical Activity. One item was used as a proxy measure of the nature of sport/physical activity participation. The measure consisted of 1 (don't take part very much), 2 (recreational involvement), and 3 (competitive level). It was used not to assess how much physical activity young people are involved in but to distinguish between types of activity. Nevertheless, the distinction between Levels 2 and 3 is likely to reflect a quantitative difference because evidence shows that young people involved in competitive sport are usually more active than those those who play more informally (Mason, 1995; Sallis et al., 2000).

Procedures

Questionnaires were administered by three trained research assistants in quiet classroom conditions in normal school time. General instructions were provided, help was offered when needed, and responses were anonymous, although pupils were requested to write their date of birth on the front sheet in case follow-up data were required.

Design and Data Analysis

To identify groups of pupils sharing similar responses on the motivational constructs, we conducted cluster analysis. The aim of cluster analysis is to identify homogeneous groups or clusters based on their shared characteristics. It differs from many of the more commonly applied multivariate statistical techniques, such as discriminant analysis, in that the researcher has no knowledge of the number and characteristics of the group before applying cluster analysis. It has not been used much in sport and exercise science research, although examples are available on physical activity and health behaviors (De Bourdeaudhuij & Van Oost, 1999) and sources of sport competence information (Weiss et al., 1997).

In hierarchical methods of cluster analysis, each observation starts out as its own cluster. Subsequently, new clusters are formed by the combination of the most similar clusters until either all clusters are grouped into one cluster or the researcher considers that a parsimonious solution has been achieved. Non-hierarchical methods (k-means) assign observations into clusters using nearest centroid sorting and requires the number of clusters to be specified (Anderberg, 1973). Since each method has some disadvantages, it is best to combine the two. The number of clusters and the profile of the cluster centers can be established using the hierarchical methods. Following that, the non-hierarchical methods can be used with the cluster centers found in the hierarchical methods. In this way the non-hierarchical methods can verify the results of the hierarchical methods (Hair, Anderson, Tatham, & Black, 1998).

MANOVA was used to test for differences between clusters on the motivational variables as well as for differences between the clusters on physical activity and PSW. In addition, differences by age (school year) and gender were tested.

Results

Descriptive Statistics and Intercorrelations

Table 1 shows the descriptive statistics for the whole sample. The participants were strongly task oriented and incremental in their beliefs about sport ability, had high scores on identified regulation and intrinsic motivation, and had moderate levels of perceived competence. Table 2 shows the intercorrelations between variables. As expected, moderate positive correlations were revealed between task orientation, incremental beliefs, and RAI.

A 2 (gender) by 3 (year group) MANOVA was calculated with the seven clustering variables as dependent variables. There was a significant multivariate interaction ($p < .005$) as well as a main effect for year group ($p < .001$), but not for gender ($p > .05$). However, significance levels with such a large sample masked very small univariate effects sizes ($eta^2 < .011$).

Cluster Analysis

To identify the different motivational patterns in young people in sport and physical education, we conduted cluster analyses using the seven motivation variables of goal orientations (task and ego), implicit beliefs (incremental and entity), relative autonomy index (RAI), amotivation, and perceived sport competence. To enhance the power of the procedure, we did not include PSW and the proxy measure of physical activity in the cluster analysis but used these later for cluster validation purposes, as advocated in cluster analytic studies (Hair et al., 1998). This allows for a clearer identification of motivational clusters based on the conceptual and theoretical arguments put forward in the introduction.

The stages of the cluster analysis decision process used were guided by the procedures outlined by Hair et al. (1998). First, the cases with missing data on any of the seven variables were excluded. Second, all the variables were standardized using Z scores (mean of 0 and a standard deviation of 1). This is standard procedure in cluster analysis. In our case it was required because RAI and perceived competence utilized different scales compared to the other variables. Standardization prevents variables measured in larger units contributing more toward the distance measured than the variables utilizing smaller units. In the next step, the univariate distributions of all clustering variables were inspected for normality. Cases with standard scores greater than 3 were classified as outliers and were deleted from further analyses. Deletion of missing cases ($n = 415$) and outliers ($n = 44$) resulted in 459 cases (15.5%) being excluded from the original sample of 2,969.

Ward's method was chosen to minimize the within-cluster differences and to avoid problems with forming long, snake-like chains found in other methods (Aldenderfer & Blashfield, 1984). The dendogram suggested five-cluster and three-cluster solutions to be suitable. However, the agglomeration coefficient showed a larger increase from four clusters merging to three (7.17%) compared to merging

Table 2 Correlation Matrix for All Variables

	1	2	3	4	5	6	7	8
1. Task								
2. Ego	.14**							
3. Incremental	.41**	.07**						
4. Entity	-.12**	.12**	-.10**					
5. Perceived competence	.33**	.21**	.26**	-.06**				
6. RAI	.47**	.03	.33**	-.30**	.50**			
7. Amotivation	-.38**	-.03	-.29**	.30**	-.41**	-.67**		
8. PSW	.29**	.14**	.21**	-.03	.72**	.41**	-.34**	
9. Physical activity	.36**	.16**	.25**	-.07**	.56**	.42**	-.39**	.43**

Note: ** *p* < .01

six clusters to five (4.40%). Because a larger increase means dissimilar clusters are merged, it was decided that the five-cluster solution was more suitable and should be carried forward for subsequent analyses.

Solutions from cluster analysis can be unstable, therefore it is advised that additional analyses be used to check the solution obtained. To confirm the clusters, a k-means clustering method was used. First, the centroid values obtained from the hierarchical methods were used as the initial seed points for the k-means clustering. The final centroid values and the cluster size were compared to those obtained from the hierarchical methods, and the profiles obtained from the k-means cluster analysis corresponded well with those obtained from the hierarchical cluster analysis, providing confidence for the five-cluster solution (see Table 3).

The next stage of the analysis was to further validate the stability of the cluster solution. This time a second k-means cluster analysis was performed with random initial seed points. The results confirmed consistency of the five-cluster results compared to the previous stage, in terms of both cluster sizes and profiles. Given the stability of the results between the specified seed points and random selection, the validity of the cluster analysis is supported.

To test the predictive validity of the cluster solution, we analyzed the measures for physical activity and physical self-worth. A one-way MANOVA was conducted using physical activity and physical self-worth as dependent variables and the clusters as the independent variable. The results showed significant differences between the five clusters on the dependent measures, Wilks' $\Lambda = .65$, $F(8, 5008) = 153.39$, $p < .001$. Table 4 contains the unstandardized and standardized (Z-score) means, and standard deviations on the dependent variables for the five clusters. Follow-up ANOVAs for physical activity, $F(4, 2505) = 215.22$, $p < .001$, and physical self-worth, $F(4, 2505) = 211.49$, $p < .001$, were significant. However, given that the physical activity measure may not be considered a true ordinal scale, an additional analysis was made of the frequency of young people in each of the three levels of physical activity involvement. The data confirmed the differences between clusters, as shown later. Thus, the predictive validity of the cluster solution was supported (see Profiles of Cluster Groups).

Gender and Year Differences in Cluster Composition

To further describe the clusters, we conducted a one-way MANOVA to test for gender and school year differences in cluster membership. The results indicated there were significant differences among the clusters on the dependent measures, Wilks' $\Lambda = .95$, $F(8, 5008) = 14.39$, $p < .001$. ANOVAs on year (Years 7, 8, and 9) and gender were conducted as follow-up tests. The ANOVA for year, $F(4, 2505) = 3.04$, $p < .02$, and gender, $F(4, 2505) = 26.09$, $p < .001$, were significant. Type I error was controlled using the Bonferroni procedure and each ANOVA was tested at the .025 level.

A closer examination of the multiple comparisons revealed that Cluster 5 contained predominantly students from the higher year groups (Years 8 and 9). There were significant gender differences between all the cluster groups except between Clusters 1 and 4 (equal number of males and females) and Clusters 3 and 5 (mainly female students).

Table 3 Cluster Means, Standard Deviations, and Z-Scores for the Five-Cluster Solution of the K-Means Cluster Analysis

	Cluster 1 "Self-determined"			Cluster 2 "Highly motivated"			Cluster 3 "Poorly motivated"			Cluster 4 "Moderately motivated externals"			Cluster 5 "Amotivated"		
	Mean	SD	Z	Mean	SD	Z	Mean	SD	Z	Mean	SD	Z	Mean	SD	Z
Variables															
1. Task	4.34	.36	.56	4.44	.38	.76	3.74	.41	−.61	4.01	.37	−.10	3.54	.58	−.99
2. Ego	2.55	.76	−.19	3.63	.70	1.09	1.95	.51	−.90	3.06	.66	.41	2.67	.80	−.05
3. Incremental	4.48	.41	.57	4.66	.34	.90	3.81	.45	−.65	4.01	.39	−.29	3.78	.61	−.71
4. Entity	1.99	.46	−.61	3.07	.64	1.08	2.16	.41	−.36	2.52	.50	.21	2.81	.66	.67
5. Perceived competence	2.99	.48	.40	3.31	.50	.94	2.44	.43	−.52	2.79	.44	.07	2.07	.50	−1.15
6. RAI	7.73	1.95	.76	6.51	2.46	.40	4.71	2.04	−.14	4.59	2.03	−.18	−.17	2.93	−1.59
7. Amotivation	1.34	.39	−.67	1.55	.59	−.40	1.80	.49	−.07	2.01	.56	.21	3.07	.69	1.59
Cluster Characteristics															
Cluster age	12.95	.89		12.92	.92		12.91	.90		12.93	.91		13.05	.87	
Cluster n	828			265			421			645			351		
Males n (%)	425 (51.3)			177 (66.8)			142 (33.7)			313 (48.5)			121 (34.5)		
Females n (%)	403 (48.7)			88 (33.2)			279 (66.3)			332 (51.5)			230 (65.5)		

Table 4 Significance Testing of Cluster Differences in Physical Activity Level and Physical Self–Worth

Variable	Cluster 1			Cluster 2			Cluster 3			Cluster 4			Cluster 5		
	Mean	*SD*	*Z*	*Mean*	*SD*	*Z*	*Mean*	*SD*	*Z*	*Mean*	*SD*	*Z*	*Mean*	*SD*	*Z*
Physical activity	2.60	.55	.38	2.82	.42	.71	2.09	.61	-.39	2.33	.62	-.04	1.77	.62	-.88
Physical self–worth	2.99	.55	.33	3.26	.56	.77	2.55	.52	-.38	2.79	.51	-.00	2.24	.58	-.89

Note: F value = 194.59 for Physical activity and 192.52 for Physical self–worth. Significance = .000 for both.
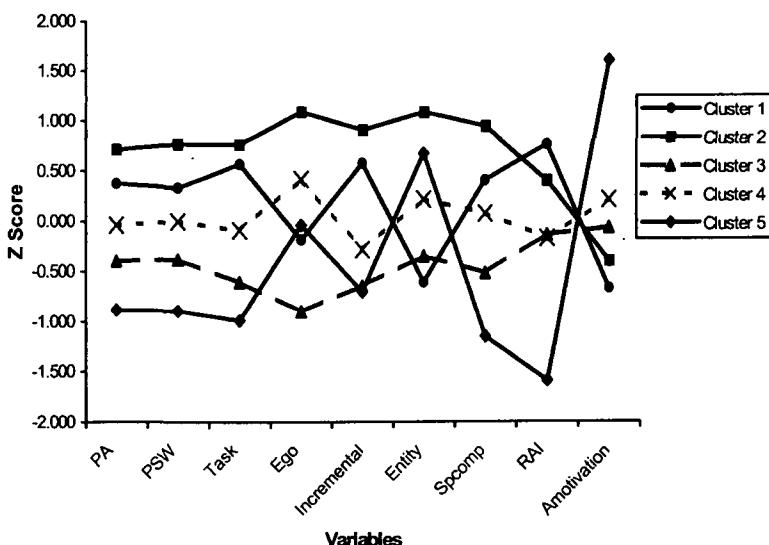
Figure 1 — Cluster profiles for the 5-cluster solution of the K-means cluster analysis, with Z-scores for physical activity and PSW added to the clustering variables.

Profiles of Cluster Groups

Figure 1 shows the graphical cluster profiles for the five-cluster solution of the k-means cluster analysis as well as Z-scores for physical activity and PSW. Z-scores of ±0.5 or greater were used as criteria to describe whether a group scored relatively "high" or "low" compared to their peers (see Tables 3 and 4 for exact Z-scores and other descriptive statistics for each cluster). The first cluster, labeled "self-determined," contained 828 students. ANOVA followed by Tukey's HSD tests indicated significant differences in all the variables between this cluster and all other clusters (at $p < .005$), and for ego orientation ($p < .05$) between Clusters 1 and 5. Specifically, this group of students had high task orientation, low entity beliefs, and moderately high perceptions of competence. They also had the highest RAI and significantly lowest amotivation compared to other clusters, as well as a positive Z-score for incremental beliefs and a negative score for ego orientation. Active involvement in physical activity (63% played competitive sport and 34.1% played recreational sport) and high physical self-worth were characteristic of these students. This cluster consisted of similar numbers of boys and girls equally distributed across all three grades.

Cluster 2, labeled "highly motivated," contained 265 students who had the highest scores on task orientation, ego orientation, incremental beliefs, entity beliefs, and perceived competence. They also had a moderately high RAI compared to other clusters. All differences were significant, $p < .001$. It is noteworthy that this group of students had significantly higher physical activity and physical self-worth compared to students in the other four clusters, $p < .001$. This cluster was made up of predominantly competitive sport participants (83.8%), with more males (66.8%) than females (33.2%), but it was equally distributed across all three grades.

Cluster 3 ($n = 421$) was labeled "poorly motivated." It consisted of students who were low in task orientation, ego orientation, incremental beliefs, and perceived competence. The differences were significant across the clusters (at $p < .001$) and for incremental beliefs (at $p < .05$) and there was no significant difference in RAI between Clusters 3 and 4, and no difference between Clusters 3 and 5 on incremental beliefs. Physical activity participation (14.5% reported "little or none"; 23.8% reported competitive involvement) and physical self-worth were relatively low in this cluster compared to the Self-Determined and Highly Motivated clusters. The Poorly Motivated cluster consisted of 67.5% females and 32.5% males, with approximately equal numbers of students from all three grades.

Cluster 4 ($n = 645$) was labeled "moderately motivated externals." This cluster consisted of students who showed a relatively flat profile, depicting scores within the +0.5 to –0.5 Z-score range. Small positive Z-scores were shown for ego orientation, entity beliefs, and amotivation. This group of students had significantly higher physical activity (51.5% recreational sport; 40.6% competitive sport) and physical self-worth compared to students in the "poorly motivated" cluster, $p < .001$. There were equal numbers of students in terms of gender and year in school.

The last cluster was labeled the "amotivated" group. It consisted of 351 students who had the lowest scores on task orientation, perceived competence, and RAI, and the highest amotivation, compared to other clusters, $p < .001$. The group was characterized by low task orientation, low incremental beliefs, high entity beliefs, low perceived competence, low RAI, and very high amotivation. They also had the lowest physical activity (33.6% doing "little or none" and only 10.5% reporting competitive involvement) and physical self-worth scores compared to other clusters, $p < .001$. This group was mostly older girls.

Discussion

Understanding the determinants of young people's participation in physical activity has been identified as a research priority (Sallis et al., 1992). While recognizing that determinants will be multifactorial and not restricted to motivation or other psychological variables (Sallis et al., 2000), it is important to identify key motivational factors associated with physical activity. Whereas previous research has studied variables in isolation, the present study sought to identify key motivational patterns in young people through cluster analysis. Such an approach has theoretical and practical value.

Results show that a large number of young people in this age range have quite positive motivational responses. Most are task oriented and have an incremental view of sport ability. In addition, they report higher levels of identified regulation and intrinsic motivation than they do for introjected and extrinsic regulation, and amotivation scores are generally low. These findings suggest that the "moral panic" often reported in the media concerning young people and their lack of physical activity seems exaggerated, at least when viewed through self-reported motivational responses.

Extrapolating further, one could conclude that many young people are positively disposed toward sport and physical activity. However, research has also shown that physical activity levels decline steeply in adolescence. In addition, with the levels of physical activity remaining too low to yield health benefits for most adults, and many young people having less than optimal health (Riddoch,

1998), there is no room for complacency. In addition, as our results show, there are groups of young people with distinct motivational profiles, some less positive than others. Thus the overall means hide important differences between clusters. This has also been found for adult sport participants when cluster analysis and self-determination theory variables were used (Vlachopoulos, Karageorghis, & Terry, in press).

In essence, results from the cluster analysis show that motivation is not characterized in simplistic terms, such as "high" versus "low." For example, both the Self-Determined and Highly Motivated clusters were what one might call "motivated" and "positive" in their self-perceptions, as the validation data on physical activity and PSW confirmed. However, while both clusters reported low rates of nonparticipation, they showed different types of involvement by young people. The Self-Determined cluster showed higher numbers in recreational involvement whereas a large percentage of the Highly Motivated cluster reported playing competitive sport, likely reflecting the high scores on task *and* ego orientation (Fox et al., 1994). The other main difference was shown by the Highly Motivated cluster being high in entity beliefs whereas the Self-Determined group showed lower scores on this variable. A self-determination theory approach might question whether more externally-referenced factors, such as ego and entity beliefs, have the same motivational stability as the profile depicted by the Self-Determined group. This is a key research question that can only be resolved over time.

Past research has pointed to the importance of different goal profiles in creating different motivational patterns. Few studies have used cluster analysis to identify individual differences in achievement goal patterns. The results of the present study confirmed the presence of high task/high ego, high task/low ego, low task/high ego, and low task/low ego groups. Consistent with previous research, it was found that the high task groups were positively related to adaptive motivational behaviors. Those groups were more active in physical activity participation, had high perceived competence and PSW, perceived their participation to be self-determined (i.e., high RAI), and were not amotivated.

Although high task orientation is conducive to motivated behavior in the physical domain, high ego orientation may not necessarily be motivationally maladaptive, as discussed. The cluster profiles found that the groups that require immediate attention for intervention were those with low task and low ego orientations. These two clusters were the Poorly Motivated and the Amotivated groups. Both consisted of more girls than boys, the latter cluster also having students from the higher age group, confirming data from other studies on physical activity trends (Pratt et al., 1999). Interventions are needed to help young people feel a sense of personal control and autonomy, such as the creation of a mastery motivational climate (Ntoumanis & Biddle, 1999a) and autonomy-supportive environment (Ryan & Deci, 2000a).

Students who were clustered into the Self-Determined or Highly Motivated groups had high incremental beliefs (although this was only a trend for the former cluster), high perceived competence, and low amotivation. In terms of physical activity participation and physical self-worth, they were also higher compared to the other clusters. On the other hand, the amotivated group showed low task orientation, low incremental beliefs, high entity beliefs, low perceived competence, low physical activity, and low PSW. This cluster reflects low confidence about being able to improve and succeed. For example, these young people have developed the belief that sport ability is relatively stable and the product of talent, and

this is reflected in feelings that they do not possess competence, as they construe it. Interventions designed to reappraise the nature of success are indicated.

In terms of gender differences in the cluster composition, previous research in physical education and physical activity has found that attraction toward physical activity tends to decrease with age in girls (De Bourdeauhuij, 1998). The findings of the present study are consistent with this. A greater number of older girls were represented in the clusters characterized by low perceived competence and high amotivation. Moreover, boys were overrepresented in the Highly Motivated group. The results suggest that older female students with low perceived competence, low task orientation, and low incremental beliefs should be the main focus for interventions designed to increase physical activity. This is congruent with the study by Weiss et al. (1997) who, also using cluster analysis, found that motivationally "at risk" children were those with a low self-perception. The implications for physical educators, and other physical activity promotion specialists, center on the need to promote autonomy, a mastery climate, and to emphasize the importance of learning and incremental aspects in acquiring sport and other physical activity skills.

Limitations of the study should be recognized. First, the study is cross-sectional and would benefit from additional data collected at a later time to enable the predictive validity of the clusters. Second, additional variables could have been included, such as those reflecting affective responses to physical activity. The study investigated only a relatively restricted range of motivational factors. Third, the assessment of physical activity is crude, although the results of the validation procedure showed highly consistent and interpretable results in differentiating clusters on this variable.

In conclusion, the use of cluster analysis in this study shows that it is useful in identifying groups of students with different motivational patterns. This has helped to study the defining characteristics of important subgroups, and consequently intervention programs can be designed to better target such groups. For example, identifying groups as "high" or "low" in motivation is likely to miss important information. In addition, the results suggest that targeting just goal orientations for intervention may not be advisable. It may be more worthwhile to look at students' conceptions of sport ability beliefs, perceived competence, and behavioral regulations, *together with goal orientations,* to gain a deeper understanding of motivation. Given the multidimensional nature of motivation, studying such factors in combination may prove fruitful.

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