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Motivational Profiles and Their Associations With Achievement Outcomes

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With the belief that theoretical integration in motivation may help us better understand motivational behavior, we designed this study to explore adolescents' motivational profiles and their associations with knowledge acquisition, leisure-time exercise behaviors, and cardiorespiratory fitness. Middle school students from a large urban inner-city school district (*N* = 603, ages 12–14) completed questionnaires assessing motivational constructs and leisure-time exercise behavior. Knowledge and cardiorespiratory fitness were also assessed with a knowledge test and the Progressive Aerobic Cardiovascular Endurance Run (PACER) test, respectively. Using hierarchical cluster analysis, we found that students' motivation in physical education could be explained from a multi-theoretical perspective. The interactive patterns among different motivation constructs were homogeneous overall and associated with in-class effort, knowledge, and leisure-time exercise behavior. These findings suggest that students' development in physical education may depend upon a collective impact of changes in knowledge, physical activity ability, and sources of motivation.

Keywords: knowledge acquisition, leisure-time exercise behavior, cardiorespiratory fitness

Physical activity involvement steeply declines during adolescent years (Pate et al., 2005). Specifically, the National Heart, Lung, and Blood Institute's Growth and Health Study reported that adolescents' median activity scores decreased dramatically between the ages of 12 and 18 years (Kimm et al., 2002). Several government agencies and public health authorities have established guidelines for physical activity among young people, but most adolescents are not active at these recommended levels (Centers for Disease Control and Prevention, 1997; U.S. Department of Health and Human Services, 2000). Consequently, rates of obesity and type II diabetes are increasing among all young age groups, and are particularly high among urban minority adolescents (Ogden, Flegal, Carroll, & Johnson, 2002).

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There is a consensus among public health professionals that school-centered interventions, especially physical education based, are promising avenues to promote physical activities for all school-age children (Corbin, 2002). Evidence in recent studies (Morgan, Beighle, & Pangrazi, 2007) strongly suggests that physical education makes an immediate and unique contribution to adolescents' daily physical activity involvement. Clearly, understanding adolescents' motivational characteristics and their relationships with physical activity knowledge and involvement will aid physical educators in the design of effective physical education programs. Researchers studying motivation in physical education have generated many informative findings (e.g., Chen & Darst, 2001; Shen, McCaughtry, & Martin, 2007b; Xiang, McBride, & Bruene, 2006). In particular, motivational constructs from theories on achievement goals, task value, and self-determination have been identified as important motivators involved in the teaching and learning of physical education (Solmon, 2003).

Achievement Goals

Since the pioneering work by Duda and Nicholls (1992), researchers in physical education have adopted achievement goal theory as a major theoretical framework for studying motivation. Similar to the definition widely adopted in education research, goals in physical education are conceptualized as underlying purposes that students can adopt in guiding their learning behavior. To date, research in physical education has primarily employed Duda and Nicholls's (1992) dual-goal orientation construct (mastery and performance) to describe two distinctive achievement goals. Students with high mastery-goal orientations are concerned with completing tasks and developing competence, whereas students with performance-goal orientations are usually concerned with demonstrating competence in comparison with their peers.

In recent years, researchers (Elliot & Church, 1997) have extended the dual-goal orientation construct into a trichotomous goal framework that identifies performance-approach and performance-avoidance goals as subsets of performance goals. Further, Elliot and colleagues (Elliot & McGregor, 2001) have proposed a 2 × 2 achievement goal framework that fully incorporates the mastery-performance and approach-avoidance distinctions. Crossing these two dimensions yields four types of goal orientations: mastery-approach (focused on mastering tasks, learning, and understanding), mastery-avoidance (focused on avoiding misunderstanding, not learning and not mastering a task), performance-approach (focused on seeking favorable judgments of competence in relation to others), and performance-avoidance (focus on avoiding unfavorable judgments of competence relative to others).

In general, researchers (Walling & Duda, 1995; Xiang & Lee, 2002) have found that physical education students with high mastery-goal orientations are likely to perceive success and failure in learning as associated with effort, to select more challenging learning tasks, and to enjoy their learning experiences. Students with high performance-goal orientations, on the other hand, tend to avoid difficult learning tasks and to attribute success or failure to natural ability. These students are also more likely to become motivated when they believe their performance is superior to their peers. In addition, researchers have reported grade-related changes in achievement goals in physical education settings. Xiang and Lee (2002), for example, examined grade-related differences in achievement goals and found that students in the upper grade levels tended to be inclined more toward a performance goal orientation than students in the lower grade level. However, Xiang and Lee (2002) found no gender differences in goal orientations in physical education settings. Guided by the trichotomous achievement goal framework, Agbuga and Xiang (2008) investigated Turkish secondary school students' motivation. They found that mastery goals and performance-approach goals emerged as significant positive predictors of students' self-reported persistence/effort, but their predictive power varied by grade.

Task Value

According to Wigfield and Eccles (2000), task value is defined as the incentive for engaging in different tasks. Attainment value (importance), intrinsic value (interest), and utility value (usefulness) are important dimensions of subjective task value. Attainment value is an individual's belief about the importance of doing well on a given activity. It is based on salient aspects of the one's core personal ideas and values (Wigfield & Eccles, 2000). Intrinsic value, or interest, refers to the enjoyment an individual obtains from performing an activity or the subjective interest the individual has for the task. Utility value is an individual's perceptions of how a task fits into their current or future goals.

Students' subjective task values have been found to be important dimensions affecting learning in physical education. For example, Cox and Whaley (2004) found that high school students' interest and usefulness were positively associated with effort and persistence in a physical education basketball unit. Similarly, Xiang et al. (2006) reported that elementary school children's intention for future participation in physical education was positively related to their corresponding subjective task values.

Self-Determination

Self-Determination theorists suggest that psychological needs are essential for growth and well-being in every individual (Deci & Ryan, 2000). They posit that, in education, opportunities to experience autonomy, competence, and relatedness (each representing an innate psychological need) are critical in promoting satisfaction and optimal learning (Reeve, Bolt, & Cai, 1999). According to self-determination theory (SDT), the need for autonomy refers to the basic need to experience one's behavior as self-endorsed or volitional. Competence is the need to experience satisfaction in exercising and extending one's capabilities (Deci & Ryan, 2000). Finally, relatedness concerns the need to seek and develop secure and connected relationships with others. In physical education, relatedness is grounded partly in students' relationships with their classmates and teachers.

Researchers in physical education have found that students with greater perceived autonomy are often more self-determined because they internalize to a greater extent their reasons for executing a given behavior, which in turn leads to greater motivation (e.g., persistence in task) (Standage, Duda, & Ntoumanis, 2003). Likewise, students who perceive greater competence demonstrate more intrinsic motivation and enhanced leisure-time physical activity intentions than those who find these needs thwarted (Shen et al., 2007b). Perceived relatedness in physical education has also been related to intrinsic motivation. Students with greater perceived relatedness are more likely to fulfill adaptive physical education-related outcomes, such as increased positive affect, better concentration, and preference for challenging tasks (Standage et al., 2003).

Integrating the Theories

The significance of integrating motivation theories is evident. First, given that school physical education has multiple objectives (National Association of Sport and Physical Education, [NASPE], 2004), such as learning knowledge and skills, social responsibility, and physical activity engagement, a single motivational construct may not provide a relatively comprehensive and plausible explanation for students' overall motivation in physical education (Chen & Ennis, 2004. Studying motivation variables in combination will better help us understand adolescents' motivation and the relationships among motivation, learning, and exercise behavior in physical education. Second, because there is a general convergence of evidence from various motivation theories concerning the optimal design of learning environments (Deci & Ryan, 2000; Lee, Whitehead, Ntoumanis, & Hatzigeorgiadis, 2008), studying motivation variables in combination serves as a foundation to explore models of motivation that complement, extend, and synthesize existing knowledge (Duda & Hall, 2001). Lastly, traditional conceptions of motivation in physical education often simplify the complexity of motivation in physical education with a limited focus on profiles that might exist between different motivational frameworks (Wang & Biddle, 2001). Studying motivation variables in combination may enrich motivation theory in physical education and shed light on the debate of whether different motivational constructs can coexist in different degrees within the same student.

In physical education, researchers have examined the interdependent effects of different motivational constructs. Ntoumanis (2002) investigated British middle school students' motivational profiles in physical education using self-determination theory. Based on a cluster analysis, three motivational profiles named the "self-determined profile," "moderate motivation profile," and "controlling motivation/amotivation profile," were identified according to students' levels of self-determined motivation, effort, enjoyment, cooperative learning, and controlling motivation. Wang, Chatzisarantis, Spray, and Biddle (2002) also examined British adolescents' goal orientations and perceived competence profiles. The authors found clusters reflecting "highly," "moderately," and "lowly" motivated students. Physical activity, incremental sport ability beliefs, and self-determined motivation were highest in the highly motivated clusters. High motivation toward physical activity was characterized by high task and high ego orientations, and high perceived competence. Similar results have been found by Boiche, Sarrazin, Grouzet, Pelletier, and Chanal (2008).

Although informative, some limitations in previous profile research need to be addressed. First, most studies have been based on achievement goal theory, self-determination theory, or a mix of both theories. Few have explored other important motivational constructs, such as task values, in organizing the motivational profiles. Second, most researchers have assessed the motivational outcomes with only self-reported measures whereas few have examined the association of motivational profiles with objective achievement assessments, such as performance and knowledge learning. Solely relying on such single-type measures might inflate variance shared with motivational profiles (Boiche et al., 2008). Last, NASPE (2004) has emphasized that an important goal in physical education is to provide students with the necessary knowledge, skill, and competence to participate in physical activity outside of school, during their leisure time. However, few researchers have addressed this carryover process.

Purposes of This Study

The purpose of this study was to identify adolescents' motivational profiles and the relationships of these profiles with achievement outcomes. Specifically, we sought to investigate two research questions: (a) to what extent were adolescents' motivational profiles based on important motivational constructs distinctive in physical education? and (b) to what extent would the motivational profiles be associated with achievement outcomes represented by in-class effort, knowledge acquisition, leisure-time exercise behavior, and cardiorespiratory fitness?

Methods

Participants

This study was part of a larger, 3-year-long project that was designed to enhance urban adolescents' physical activity involvement and fitness through physical education. This study was conducted using the second-year data set. Participants were 409 seventh and 194 eighth graders (269 females, 334 males; age range = 12–14 years, mean age = 12.6 years) enrolled in four urban middle schools from a large urban inner-city school district in the U.S. Midwest. Six regular physical education classes in each school were selected. Before commencing, permission to conduct the study was obtained from the university review board, the school district, the participants, and their parents. Recruitment of participants occurred during regular physical education classes. The physical education teachers helped introduce the study to the students. Administrators at each school distributed written information regarding the study via their established weekly newsletters and information sessions. Invitation letters were also sent home with students with their weekly communication materials.

The four schools were demographically similar. A majority of the students came from a low- to a lower-middle socioeconomic background (United States Census Bureau, 2007). Minority students composed over 90% of the participants, which was reflective of the community. Specifically, the student body was 89% African American, 4% Caucasian, and 7% Hispanic American.

The Personal Conditioning curriculum (Michigan Fitness Foundation, 2005) was implemented in the schools. The purpose of this curriculum was to provide students with the knowledge and skills they needed to begin a personal conditioning program that includes fitness objectives, knowledge of names and locations of muscles and muscle groups, and a variety of strengthening and flexibility exercises. In addition, students received instruction on the basics of conditioning, including definitions of physical fitness and cardiorespiratory endurance, injury prevention, and conditioning principles. The curriculum was taught by two full-time certified physical education teachers in each school throughout the semesters. Their teaching experience ranged from 10 to 20 years. The schools, similar to the rest in the district, had a 60-min physical education class every other day and the class sizes ranged from 30 to 35 students.

Cluster Measures

Achievement Goals. Students' orientations toward mastery, performance-approach, and performance-avoidance goals were assessed with three items each, using a 5-point Likert scale. These items were adapted from Goal Orientation Scales (Midgley, Kaplan, Middleton, & Maehr, 1998). An example item for mastery goals was, "an important reason why I do physical education is because I like to learn new things." An example item for performance-approach goals was, "I would feel successful if I did better than most of the other students in my physical education class." An example item for performance-avoidance goals was, "my goal in my physical education class is to avoid performing poorly." Shen, Chen, and Guan (2007a) supported the scale's application in physical education with similar aged participants using exploratory and confirmatory factor analyses. Cronbach's alpha coefficients in their study were .75 and above for all subscales.

We did not bifurcate the mastery goal construct in terms of approach/avoidance in this study because we suspected that the two submastery goals (mastery approach and mastery avoidance) might lack discriminant validity for middle school physical education. Wang, Biddle, and Elliot (2007) explored the 2×2 achievement goal framework with Singapore students. The high correlation between mastery-approach and mastery-avoidance goals ($r = .65$) in their study indicated that students' overall mastery-goal orientation in physical education might be convergent.

Task Value. Students' attainment value (importance), intrinsic value (interest), and utility value (usefulness) in physical education were assessed with two items each, using a 5-point Likert scale. These items were adopted from the Task Value Scale in Physical Education (Xiang, McBride, Guan, & Solmon, 2003). An example item for importance is, "for me, being good at physical education is . . . (1 = *not important at all*, 5 = *very important*)". An example item for interest is, "in general, I find physical education is . . . (1 = *very boring*, 5 = *very fun*)." Last, an example item for usefulness is, "compared to your other school subjects, how useful is what you learn in PE . . . (1 = *not useful at all*, 5= *very useful*). Support for the internal reliability of all scales with similar aged participants has been shown in Xiang et al. (2003) ($\alpha \geq .80$ for all subscales).

Psychological Needs. To assess the degree to which participants experienced the satisfaction of three psychological needs in physical education, we used three separate validated questionnaires. Specifically, students' perceived autonomy in physical education was measured using the average of the five items adopted by

Standage et al. (2003) from Ntoumanis (2001). Participants responded to the items (e.g., "I feel that I can make a lot of inputs to deciding what to do in physical education.") preceded by the stem "in this physical education class." Responses were made on a 5-point Likert scale anchored by 1 (*strongly disagree*) to 5 (*strongly agree*). Support for the internal reliability of the scale has been reported in Standage et al. (2003) with similar aged participants ($\alpha = .81$).

As a basic psychological need, perceived competence in physical education was assessed using the average of the three items from the Perceived Competence subscale from the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989). For this study, the stem was reworded to target the physical education context. A sample stem was, "how good are you at PE?" A sample item from the competence subscale was, "I think I am pretty good at PE." Responses were recorded using a 5-point Likert scale anchored by 1 (*strongly disagree*) and 5 (*strongly agree*). The competence subscale of the IMI has demonstrated acceptable reliability with similar aged participants in physical education (e.g., Shen et al., 2007b; $\alpha = .73$).

Finally, perceived relatedness in physical education was assessed using eight items from the Relatedness subscale of Basic Need Satisfaction Scale (Deci et al., 2001). The scale was initially used in the workplace, but it was modified to assess relatedness need satisfaction in physical education (Ntoumanis, 2005). An example item was, "I really like the students I exercise with in PE." Responses were indicated on a 5-point Likert scale anchored by 1 (*not at all true*) and 5 (*very true*). Ntoumanis (2005) reported an adequate alpha coefficient for the subscale with similar aged participants in physical education ($\alpha = .84$).

Criterion Measure

The particular cluster-analytic procedure used in this study required the use of a criterion measure to demonstrate a statistical distinction between resulting clusters. We adapted the Xiang et al. (2003) single-item measure of intention for future physical education participation as the external criterion. The item is, "if you will have a choice whether you want to participate in PE, how much would you like to do it?" Responses were indicated on a 5-point Likert scale anchored by 1 (*not at all*) and 5 (*very much*).

This measure was used as the external criterion for two reasons. First, an individual's intention is the strongest predictor and immediate antecedent of a behavior (Ajzen, 1991). Using the intention as the external criterion would well reflect the influence of students' motivation in current physical education class on future physical education participation. Second, intention is one of the most common outcome variables in motivation studies. The impact of achievement goals, task value, and self-determination theories on intention has been demonstrated (e.g., Xiang et al., 2006; Standage et al., 2003. Therefore, we believe that using intention as an external criterion is appropriate and informative. However, using a single-item measure of intention made it impossible to evaluate the scale psychometric properties. Caution must be taken when one intends to generalize the results to other settings.

Achievement Outcomes

In-Class Effort. The physical education teachers were asked to provide an overall rating of each student's levels of effort in physical education. For each student, his or her physical education teacher provided a single rating on a 7-point scale (1 = *no effort at all*; 7 = *high levels of effort*). In the initial introduction, the physical education teachers were informed that the scale was going to assess how hard the students tried to improve their skills and whether they "do their best" during physical education lessons.

Compared with students' self-report, teachers' evaluations were more objective (Ntoumanis, 2005). Because the teachers in this study were carefully selected and they expressed confidence when rating their students, we believe the ecological validity of this measure was satisfied. In future studies, a more comprehensive evaluation, including self-reports, teacher ratings, and behavioral observations, is recommended to better reflect students' performance in class.

Knowledge. Students' knowledge in personal conditioning was assessed using a 14-item multiple-choice test designed for the current study. All items on this test were directly derived from the Personal Conditioning Module assessment battery (Michigan Fitness Foundation, 2005), which was designed specifically to assess students' knowledge about conditioning. Given that assessment is an integral part of the curriculum and was developed by the state curriculum-writing team, we believe the content validity can be assumed. As illustrated below, the purpose of this test was to gauge students' cognitive understanding of personal conditioning and exercise.

> Question: Your heart rate measures which basic part of a personal conditioning workout?
>
> (a) *frequency*
>
> (b) *intensity* (correct answer)
>
> (c) *time*
>
> (d) *specificity*

The items in the multiple-choice test were dichotomously scored as correct (1 point) or incorrect (0 point). The maximum score of this test was 14 points. The Cronbach internal consistency coefficient (α) was .72 in this study, indicating an acceptable level of reliability for the measure.

Leisure-Time Exercise Behavior. A three-item Leisure-Time Exercise Questionnaire (Godin & Shephard, 1986) was used to assess students' moderate-to-vigorous exercise during their leisure time. The concurrent and criterion validity of the measure has been confirmed against more objective measures such as heart rate monitoring (Sallis, Buono, Roby, Micale, & Nelson, 1993). In the questionnaire, students first read the header, "how many times in an average week do you do the following kinds of exercise for more than 15 minutes during your leisure time?" Below the header, students responded to the following three statements: strenuous exercise (heart beats rapidly), moderate exercise (not exhausting), and mild exercise (minimal effort). Following each statement, many examples of age-appropriate activities indicative of each category were provided along with space to record how many times per week the students took part in each type of exercise. Their answers were then multiplied by 9, 5, and 3 metabolic-equivalent (MET) units for strenuous, moderate, and mild exercise, respectively, as stipulated by Godin and Shephard (1985). The sum of the total METs was used to represent students' leisure-time exercise involvement.

Cardiorespiratory Fitness (CF). Cardiorespiratory fitness was assessed with the Progressive Aerobic Cardiovascular Endurance Run (PACER), developed by the Cooper Institute for Aerobics Research (1999) for measuring adolescents' cardiovascular fitness. The objective of the test is to run back and forth across a 20-m distance as many times as possible. The PACER compact disc, which consists of beep sounds, is played during the test. Students must wait for the beep before running in the opposite direction. Every minute the beeps come faster, causing students to run faster. The final score is the number of times the students can run the 20-m distance before the test is finished. Detailed test protocols can be found in the Fitnessgram test administration manual (Cooper Institute for Aerobics Research, 1999). The validity and reliability of the PACER test have been well established (Morrow, Jackson, Disch, & Mood, 2000).

Procedure

Student data were collected during regular physical education classes. A data collection team, including three retired physical education teachers and two graduate students, were trained to administer surveys and the PACER test. At the beginning of a class, the data collection team was responsible for distributing pencils and all scales. One data collector read each question aloud to the students while the others circulated among the students to help those having difficulty. After the knowledge test and self-report instruments were collected and checked, students took part in the PACER test. The same protocol for the PACER test was followed in all schools. The teachers' ratings of their students' effort in physical education was obtained during their professional development time.

Analyses

In preliminary analyses, all data were subjected to descriptive analyses and a series of statistical assumption tests. Reliability of the questionnaire data were examined using Cronbach's (1951) approach for internal consistency. Pearson product–moment correlation analyses were conducted to examine the overall relationships among the study variables.

A hierarchical cluster analysis was conducted to determine the kinds of motivational profiles that would result from the interactions among the motivational constructs. This approach was chosen because of its robustness in identifying homogeneous groups or clusters based on their shared characteristics (Lattin, Carroll, & Green, 2004). Next, multivariate analyses of variance (MANOVAs) were used to analyze differences between clusters on motivational variables as well as for differences between clusters on in-class effort, knowledge, leisure-time exercise behavior, and cardiorespiratory fitness.

Results

All scales demonstrated acceptable reliability, with the Cronbach's alphas ranging from .70 to .90. Table 1 reports descriptive statistics. A MANOVA was conducted to examine school effect on students' responses. That is, whether students' responses differed simply because they were in different schools. The results revealed no significant overall differences among schools, Wilks's $\Lambda = .87$, $F(42, 1674) = 2.26$, $p = .057$. Therefore, the data from the four schools were combined into one data set for further analyses. Given the multivariate nature of this study, we examined the assumption of multivariate normality and the homogeneity of variance–covariance matrices. The values of skewness ranged from −.73 to .98, suggesting that the variables were approximately normally distributed. Box's M test revealed that the assumption of homogeneity of variance–covariance matrices was also met.

Overall, the participants were mastery-goal oriented and had high task values for physical education. They also had moderate levels of perceived autonomy, competence, and relatedness in physical education. In addition, the participants had intermediate scores on the knowledge test and the teachers' rating of in-class effort. Their leisure-time exercise behavior and cardiorespiratory fitness were at moderate levels. Table 2 shows the intercorrelations between cluster variables.

Table 1 Descriptive Statistics and Internal Consistency Coefficients for Overall Sample (*n* = 603)

Variable	Maximum	*M*	*SD*	α
Mastery	5.00	3.91	.93	.83
Performance Approach	5.00	3.23	1.17	.75
Performance Avoidance	5.00	2.36	1.24	.70
Importance	5.00	4.07	.92	.88
Usefulness	5.00	3.90	.94	.80
Interest	5.00	4.19	.93	.82
Perceived Autonomy	5.00	3.51	0.96	.81
Perceived Competence	5.00	3.29	1.23	.72
Perceived Relatedness	5.00	3.86	.92	.79
Intention	5.00	4.12	1.01	—
In-Class Effort	7.00	5.44	1.37	__
Knowledge	14.00	7.53	2.32	.72
Leisure-Time Exercise	74.94	29.45	12.66	__
Cardiorespiratory Fitness	60.00	17.57	9.39	__

Cluster Analysis

To investigate the motivational profiles of the participants, we performed cluster analysis to detect emergent clusters. Specifically, we chose Ward's minimum-variance hierarchical clustering technique (Lattin et al., 2004) to classify individuals on the basis of the variables of mastery goals, performance-approach goals, performance-avoidance goals, importance, usefulness, interest, perceived autonomy, competence, and relatedness. To begin Ward's hierarchical clustering procedure, a distance matrix among the variables was computed with the estimation from measures of association. Using dendrograms, a type of visual aid, we summarized cluster-analysis results in a graphic that corresponded to a hierarchical tree structure generated by the iterative sequence. In our analysis, two noticeable gaps between identified clusters were found, indicating that the interactive features of the motivation variables were distinctive between the clusters. Therefore, we classified the participants into three cluster groups.

In addition, we conducted two analyses to ensure the validity of the emergent clusters. First, we examined how the clusters differed on the external criterion—intention to participate in future physical education—with the assumption that members of the emergent clusters would be distinctive with respect to their intentions. Second, we used discriminant function analysis to verify the multidimensional nature of the clusters. Consistent with our assumption, an analysis of variance examining the intention scores for the three clusters was statistically significant, $F(2, 600) = 167.0$, $p < .00$, $\eta^2 = .36$, indicating that the clusters differed on this external criterion. Post hoc analyses of the between-groups differences using Fisher's least significant difference (LSD) revealed that members of the three clusters differed significantly in their intentions to participate in future physical education. The members in Cluster 1 scored the highest, whereas those in Cluster 3 scored the lowest (see Table 2).

Then, we performed discriminant function analysis to examine whether the clusters had the right configuration of motivational variables or multidimensional characters. The goal of this analysis was to provide support for the assertion that the clusters arose from the interplay of different motivational variables and could not be attributed to differences in a single construct. For this discriminant function analysis, multiple constructs—including mastery goals, performance-approach goals, performance-avoidance goals, importance, usefulness, interest, perceived autonomy, competence, and relatedness measures—were used to predict group membership. Results demonstrated that, overall, 95.5% of cluster membership was predicted correctly. Specifically, there were 98%, 93.7%, and 93.7% accuracy rates for Clusters 1, 2, and 3, respectively. Last, we calculated Cohen's kappa to ensure that the percentage of correct classification over and above what would be expected was not due to chance. We found 80% improvement over chance. Collectively, these verifications support the three emergent clusters solution. Table 3 summarizes the descriptive statistics of the three clusters. Based on their attributes, we refer to those three as *autonomy oriented* (Cluster 1: $N = 253$), *performance goal enriched* (Cluster 2: $N = 191$), and *low motivated* (Cluster 3: $N = 159$).

Table 2 Correlation Coefficients Between Cluster Variables

	1	2	3	4	5	6	7	8	9
1. Mastery	—								
2. P-Approach	.22**	—							
3. P-Avoidance	.12*	.42**	—						
4. Importance	.48**	.19**	.02	—					
5. Usefulness	.46**	.06	−.05	.53**	—				
6. Interest	.53**	.08	−.07	.49**	.49**	—			
7. P-Autonomy	.30**	−.18**	−.50**	.23**	.29**	.43**	—		
8. P-Competence	.24**	.20**	.04	.20**	.19**	.28**	.12*	—	
9. P-Relatedness	.31**	.12*	−.02	.32**	.35**	.40**	.22**	.40**	—

Note. P-Approach = performance-approach goal, P-Avoidance = performance-avoidance goal, P-Autonomy = perceived autonomy, P-Competence = perceived competence. P-Relatedness = perceived relatedness.

*$p < .05$, **$p < .01$.

Descriptions of the Clusters

To understand the differences among the clusters, we conducted a MANOVA with the cluster groups as the independent variable and mastery goals, performance-approach goals, performance-avoidance goals, importance, usefulness, interest, perceived autonomy, competence, and relatedness as the dependent variables. Results of the MANOVA indicated significant overall differences among cluster groups, Wilks's $\Lambda = .12$, $F(18, 1184) = 123.57$, $p < .01$. Univariate follow-ups revealed that the cluster groups were significantly different on mastery goals, $F(2, 600) = 220.9$, $p < .01$, $\eta^2 = .42$; performance-approach goals, $F(2, 600) = 98.1$, $p < .01$, $\eta^2 = .24$; performance-avoidance goals, $F(2, 600) = 354.7$, $p < .01$, $\eta^2 = .54$; importance, $F(2, 600) = 178.9$, $p < .01$, $\eta^2 = .37$; usefulness, $F(2, 600) = 151.84$, $p < .01$, $\eta^2 = .34$; interest, $F(2, 600) = 283.3$, $p < .01$, $\eta^2 = .49$; perceived autonomy, $F(2, 600) = 264.15$, $p < .01$, $\eta^2 = .47$; competence, $F(2, 600) = 33.5$, $p < .01$, $\eta^2 = .10$; and relatedness, $F(2, 600) = 82.2$, $p < .01$, $\eta^2 = .22$. Further, to better understand the significant univariate effects among the three cluster groups, we conducted a series of multiple comparisons using Fisher's LSD procedure. Based on the post hoc analyses, all cluster groups were significantly different. The results of these between-cluster comparisons are presented in Table 3 as subscript designations.

Knowledge and Physical Activity Differences in Cluster Composition

To examine the predictive validity of the cluster solution on learning outcomes, we conducted another MANOVA using the clusters as the independent variable and in-class effort, knowledge, leisure-time exercise behavior, and cardiorespiratory fitness as dependent variables. The results showed significant differences between the three clusters on the dependent measures, Wilks's $\Lambda = .85$, $F(8, 1194) = 12.60$, $p < .01$. Univariate follow-ups using Fisher's LSD procedure showed that the cluster groups were significantly different on in-class effort, $F(2, 600) = 7.22$, $p < .01$, $\eta^2 = .04$; knowledge, $F(2, 600) = 32.70$, $p < .01$, $\eta^2 = .12$; leisure-time exercise behavior, $F(2, 600) = 4.09$, $p < .05$, $\eta^2 = .03$; and cardiorespiratory fitness, $F(2, 600) = 13.72$, $p < .01$, $\eta^2 = .06$. The outcomes of these multiple comparisons are represented in Table 4 as subscripts.

Discussion

Our study was designed to investigate urban adolescents' motivational profiles and their relationships with in-class effort, learning, exercise behavior, and cardiovascular fitness. Cluster analysis and MANOVAs were conducted to achieve these purposes. Overall, the results of this study shed additional light on traditional conceptions of motivation in physical education. Consistent with the calls for conceptual convergence across motivation constructs in physical activity (Duda & Hall, 2001), our findings suggest that motivation in physical education is multidimensional. It is very possible that different motivational constructs can be encountered in different degrees within the same student, thus presenting a complex construct of motivation in reality.

Table 3 Cluster Means and Standard Deviations for the Three-Cluster Solution

	Cluster 1 (AO) (*n* = 253)		Cluster 2 (PG) (*n*=191)		Cluster 3 (LM) (*n*=159)	
Variable	***M***	***SD***	***M***	***SD***	***M***	***SD***
Mastery	4.20_a	.71	4.35_a	.63	2.90_b	.79
Performance Approach	2.80_a	1.01	4.07_b	.82	2.93_a	.89
Performance Avoidance	1.43_a	.60	3.58_b	.93	2.36_c	1.04
Importance	4.35_a	.70	4.48_a	.61	3.14_b	.90
Usefulness	4.30_a	.69	4.12_a	.82	2.99_b	.83
Interest	4.68_a	.45	4.43_b	.69	3.13_c	.89
Perceived Autonomy	3.76_a	1.48	3.30_b	1.39	1.28_c	1.40
Perceived Competence	3.42_a	1.17	3.64_a	1.15	2.65_b	1.21
Perceived Relatedness	4.14_a	.75	4.08_a	.80	3.15_b	.92
Intention	4.62_a	.60	4.27_b	.83	3.15_c	1.04

Note. Subscript letters (*a*, *b*, and *c*) that differ in each row denote which group means are significantly different from one another ($\alpha = .05$). AO = autonomy-oriented cluster. PG = performance goal-enriched cluster. LM = low-motivated cluster.

Table 4 Cluster Differences in In-Class Effort, Knowledge, Leisure-Time Exercise Behavior, and Cardiorespiratory Fitness

	Cluster 1 (AO) (*n* = 253)		Cluster 2 (PG) (*n* = 191)		Cluster 3 (LM) (*n* = 159)	
Variable	***M***	***SD***	***M***	***SD***	***M***	***SD***
In-Class Effort	5.62_a	1.18	5.30_b	1.37	5.14_b	1.37
Knowledge	8.40_a	1.97	6.85_b	1.92	6.82_b	2.45
Leisure-Time Exercise	30.35_a	11.47	31.04_a	12.01	26.12_b	9.15
Cardiorespiratory Fitness	19.97_a	9.99	16.73_b	8.95	15.21_c	8.35

Note. Subscript letters (*a*, *b*, and *c*) that differ in each row denote which group means are significantly different from one another ($\alpha = .05$). AO = autonomy-oriented cluster. PG = performance goal-enriched cluster. LM = low-motivated cluster

The autonomy-oriented cluster was markedly different in motivation from those in other clusters. Specifically, these students had significantly higher interest and perceived autonomy than the performance goal-enriched cluster. The performance goal-enriched cluster, in comparison, included students with significantly higher performance-approach and avoidance goals than their counterparts in the autonomy-oriented cluster. Collectively, interest, perceived autonomy, and performance goals appear to be the key motivators that separate students who were self-endorsed from those who were concerned with demonstrating competence in comparison with their peers. Otherwise, the two clusters were not significantly different on the other motivation variables. The results suggest that autonomy-oriented students are more intrinsically involved in physical education than those in the performance goal-enriched group. In contrast, seeking favorable, but avoiding unfavorable, judgments of their competence in relation to others were important motivators for performance goal-enriched cluster.

The smallest cluster, the low-motivated students, reported significantly lower scores in most variables compared with students in the autonomy-oriented and performance goal-enriched clusters. The low scores in the motivational constructs indicate that students in this group lacked overall motivation where no contingency between actions and outcomes was perceived. They seemed to lack purpose for engaging in physical education.

The different goal profiles in the clusters indicate the diversity of achievement goal patterns in physical education. Standage and Treasure (2002) suggested that mastery and performance goals are not mutually exclusive in physical education. Students can have high levels of both mastery and performance goals or low levels of each. Nevertheless, mastery goals may be decisive for increasing motivation regardless of the role of performance goals.

Our results are consistent with and extend Standage and Treasure's work (2002). Our findings confirmed the presence of different goal groups in physical education, such as

high mastery / high performance approach / high performance avoidance

high mastery / low performance approach / low performance avoidance

low mastery / low performance approach / low performance-avoidance

We found that the high mastery-goal groups were positively related to adaptive motivational behaviors. High mastery-goal oriented students in the autonomy-oriented and performance goal-enriched groups reported higher levels of perceived autonomy, competence, relatedness, and task values than those in the low-motivation cluster. They also demonstrated stronger intentions to participate in physical education in the future.

The connection between motivational profiles, learning, and physical activity engagement was significant. Overall, students' motivation levels were consistent with their in-class effort, knowledge, leisure-time exercise behavior, and subsequent cardiorespiratory fitness. Our results confirm, to a degree, that psychological, cognitive, and behavioral developments in physical education are coherent (Shen & Chen, 2006, 2007). The students in the low-motivated cluster demonstrated less knowledge and in-class effort. This cluster also reported the lowest leisure-time exercise levels and cardiorespiratory fitness scores. The lower motivation accompanied with less knowledge and exercise involvement may represent a typical, fragmented, and incoherent learning profile. This is congruent with Weiss, Ebbeck, and Horn (1997), who found that motivationally "at risk" children were those with low self-perceptions in physical activity.

Meanwhile, the students in the performance goal-enriched cluster demonstrated significantly higher levels of exercise and subsequently had higher cardiorespiratory fitness levels than the students in the low-motivated cluster. However, although students in this cluster did more exercise than those in the low-motivated cluster, there was no significant difference between the low-motivated and performance goal-enriched clusters in terms of fitness knowledge. This may indicate that that beginning learners' physical development may not always parallel increases in their cognitive understanding (Thomas & Thomas, 1994).

Finally, the students in the autonomy-oriented cluster significantly differed from those in the other clusters in terms of their in-class effort, knowledge, and cardiorespiratory fitness. They were more knowledgeable, perceived physical education as more self-initiated (reflected in interest and perceived autonomy), and demonstrated higher cardiorespiratory fitness than the students in the performance goal-enriched and low-motivated clusters. This finding suggests that the self-endorsed students' knowledge, physical activity, and motivation may have developed simultaneously (Shen & Chen, 2007).

From a practical perspective, identifying subgroups of urban adolescents who represent different motivation profiles may prove helpful for practicing teachers. Educators could locate homogenously motivated groups of students and develop group-specific strategies to increase the effectiveness of teaching and learning (Chen & Hancock, 2006). For example, given the fact that the students in the low-motivated cluster have low task values and achievement goals, and need satisfaction for physical education, using situational motivators (e.g., appealing characters of a learning task) may significantly enhance their involvement in knowledge and skill learning in physical education (Shen & Chen, 2006). We suggest that physical education teachers' instructional strategies center on promoting a mastery learning climate; emphasize the importance of learning in physical education; and present learning tasks in a situationally interesting, novel, and exploratory way (Chen & Darst, 2001). However, for the students in autonomy-oriented and performance goal-enriched clusters, they appear to have achieved more competence in physical education. Thus, solely targeting mastery goal orientations or the significance of physical education seems insufficient. Rather, promoting a transition from situational or environmental to self-initiated motivation is critical. In this case, teachers can focus on how to integrate knowledge/skill learning, motivation, and physical activity together (Chen & Hancock, 2006).

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