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High School Adolescents' Physical Activity and Physical Fitness: A 3 × 2 Achievement Goal Approach

Liang Shen ¹, Joonyoung Lee ², Changzhou Chen ³ and Tao Zhang ^{2,*}¹ School of Physical Education, Shanghai University, Shanghai 200444, China; shenliang@t.shu.edu.cn² Department of Kinesiology, Health Promotion and Recreation, University of North Texas, Denton, TX 76203, USA; joonyounglee@my.unt.edu³ School of Leisure Sport, Shanghai University of Sport, Shanghai 200438, China; Changzhou.Chen@unt.edu

* Correspondence: tao.zhang@unt.edu

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Abstract: Previous research evidence showed deficient physical activity (PA) and physical fitness (PF) performance levels among high school students. Personal goal orientations motivate their behavior; therefore, it is essential to discover high school students' goal orientations in PA and PF. Guided by the latest 3 × 2 achievement goal model, we examined the influence of six goal orientations on PA and PF in high school students. A total of 792 high school students in China (54.5% girls; $M_{age} = 16.93 \pm 0.82$) completed validated measurements assessing 3 × 2 goal orientations for PA and PF. Stepwise multiple regression analyses were used to analyze whether 3 × 2 achievement goal orientations significantly influenced the study variables. Other-approach, self-approach, and task-avoidance goals significantly predicted PA, and the 50-meter dash was predicted by other-approach and self-avoidance goals. The self-approach goal was the only significant predictor of the standing long jump. In conclusion, fostering self- and other-approach-oriented environments with developmentally appropriate content in physical education may have implications for enhancing high school students' PA and PF.

Keywords: achievement goals; motivation; physical fitness; physical activity; adolescents

1. Introduction

The prevalence of adolescent obesity has increased dramatically across the globe including the United States and China [1,2]. The number of obese youth in China has tripled over the last three decades and is continuing to increase steadily [3,4]. Obesity causes adverse health effects, including premature death [5], high blood pressure and cholesterol levels [6], cardiovascular disease [7], depression [8], and low self-esteem [9]. Regular physical activity (PA) can be beneficial for long-term physical health and physical fitness (PF), and may prevent adolescent obesity [10,11].

The World Health Organization (WHO)'s PA guidelines recommend that school-aged youth (i.e., 5–17 years old) need to spend at least one hour of moderate-to-vigorous physical activity (MVPA) daily to achieve health benefits and decrease the risk of obesity [12]. Nevertheless, a Chinese national study demonstrated that only a few adolescents (9% boys and 2% girls; aged 9–17 years old) met the recommended daily MVPA, objectively measured using accelerometers [13]. A more recent Chinese national study found that only 24.4% of the 32,563 high school adolescents met the recommended MVPA levels of 60 min per day [14]. In addition, Chinese high school students had a high prevalence of sedentary time [13,15]. Intervention studies demonstrated that structured PA lessons may lead to higher PA [16,17]. As empirical evidence has consistently shown that student motivation is strongly linked to engagement in PA and PF [18–22], identifying Chinese high school students' motivational factors for PA and PF is critical for their health promotion.

Achievement goal theory posits that individuals' achievement goal orientations affect their behaviors and achievement [23]. In the past four decades, researchers have theoretically and empirically examined and developed achievement goal orientations to understand students' motivation process in both educational and PA contexts [24–26]. Several researchers have developed and extended achievement goal theory with multiple goals. In the 1980s, achievement goal theory commenced as a dichotomous model involving mastery (i.e., task) and performance (i.e., ego) goal orientations [27,28]. Mastery goal orientation focuses on goals improving one's competence such as self-development or skill development. In contrast, performance goal orientation emphasizes goals demonstrating one's ability to respond to external indicators or outperforming others [23]. In addition, competence is combined with dimensions of valence, based on the distinction between approach (perceiving feasibility) and avoidance (perceiving unfeasibility [29]). Since the inception of achievement goals, theorists have developed trichotomous (mastery approach, performance approach, and performance avoidance [29]), 2×2 (mastery approach and avoidance, performance approach and avoidance [30]), and 3×2 models (task-approach and avoidance, self-approach and avoidance, other-approach and avoidance [31]).

The latest 3×2 achievement goal model [31] elucidates individuals' goals with six goal orientations, including three dimensions—task (improving one's own task), self (improving individuals' performance by comparing their own performance over time), and other (comparing one's own performance with others)—that are each split into two valences (i.e., approach and avoidance). For instance, in judo, participants' achievement goals can indicate the task-approach (e.g., “quickly grip the opponent's arms”), task-avoidance (e.g., “do not grip the opponent's arms too slowly”), self-approach (e.g., “move faster toward opponents than I usually move”), self-avoidance (e.g., “do not move more slowly toward opponents than I usually move”), other-approach (e.g., “outperform my opponents”), and other-avoidance (e.g., “avoid embarrassment or defeat from my opponents”). A previous study using 3×2 achievement goal orientations showed that task-approach goals are positively linked to perceived benefits of engagement in recreational sport, whereas other-approach goals were not significantly associated with the study outcome [32]. Another study indicated that task-approach and other-approach goals were positively related to perceived competence, but task-approach and self-approach goals were positively linked to intrinsic interest in sport [33].

Previous studies applied the 2×2 achievement goal model to examine adolescents' PA inside and outside of physical education (PE [34–37]). Few studies used the latest 3×2 achievement goal model to explain students' achievement goal orientations in PA and sport, predominantly among college students [32,33,38], but not in K–12 PE settings [36]. As establishing behavioral patterns in adolescence is significant for increasing long-term health benefits and preventing chronic disease risk in young adulthood [39], investigating high school students' achievement goal orientations in PA and PF is necessary for developing effective PA interventions in PE settings [40]. Expanding on the current knowledge of achievement goal orientations in high school students using the latest 3×2 achievement goal model, we aimed to investigate the associations of six goal orientations with PA and PF among high school students in PE settings. We hypothesized that task-approach and self-approach goals have positive effects on PA and PF outcomes, whereas task-avoidance and self-avoidance negatively affect the study variables. In addition, other-approach and other-avoidance goals have negative influences on high school students' PA and PF. The research findings of this study add to the literature on specific adolescents' goal orientations on PA and PF, which can be useful for PE teachers and practitioners in promoting student engagement in various physical activities.

2. Methods

2.1. Participants

Participants were 792 adolescents (54.5% girls; $M_{\text{age}} = 16.93 \pm 0.82$; $M_{\text{height}} = 168.96 \pm 10.45$; $M_{\text{weight}} = 60.24 \pm 14.04$) from four public high schools at the same school district in the Baoshan

District of Shanghai, China. PA surroundings, such as facilities, equipment, size of place, and supplies, in the participating schools were similar. Initially, we randomly selected 860 10th and 11th grade students at convenient schools with good connections to recruit the participants (12 classes total) [41]. However, 68 students' data were excluded due to incomplete and/or missing assessments (i.e., PA, PF performance). Thus, the participation rate was appropriately 92% in the present study. Students voluntarily participated in the study without rewards or incentives.

2.2. Measures

2.2.1. Achievement Goal Orientations

The 3×2 Achievement Goal Questionnaire (3×2 AGQ) [31] was employed to assess participants' achievement goal orientation. The questionnaire includes a total of 18 items, with three items representing each of the six achievement goal orientations: task-approach, self-approach, other-approach, task-avoidance, self-avoidance, and other-avoidance. The 3×2 AGQ was initially developed to investigate undergraduate students' goal orientations toward academic achievements in a school context; thus, we revised it for applicability to the PE domain for the purpose of this study. An example of a question identifying a task-approach goal is, "In PE, my goal is to perform well." Participants rated a 7-point Likert scale ranging from *not true of me* (1) to *extremely true of me* (7). By employing structural equation modeling (SEM) in SPSS AMOS 25 (Arbuckle, 2017 [42]), we assessed the convergent validity of the 3×2 AGQ to examine the degree of confidence if the shared indicators were accurate indicators of latent variables. The average variance extracted (AVE) values ranged from 0.73 to 0.89, and the composite reliability (CR) values ranged from 0.89 to 0.96, demonstrating sufficient reliability and validity [43].

2.2.2. Physical Activity

Students' PA levels were measured using the 7-day recall Physical Activity Questionnaire for Older Adolescents (PAQ-A) [44], assessing participation in various physical activities during spare time, PE, lunch break, after school, evening, and weekends. The PAQ-A includes six items with a 5-point Likert scale from low (1) to high (5); the mean of sum scores is calculated. High scores indicate a high level of general PA. The PAQ-A demonstrated sufficient test-retest reliability of general PA levels among adolescents (intraclass correlation coefficient [ICC] = 0.71) [45], and the scale showed relatively high in the internal reliability coefficient among Chinese adolescents in the current study (Cronbach's α = 0.79).

2.2.3. Physical Fitness

Students' PF performances were evaluated using the 50-meter dash and standing long jump in the present study [46]. Participants' running speed and agility were assessed using the 50-meter dash. The students were required to run as fast as possible between two lines 50 meters apart; they did this twice, and the best performance was recorded. The standing long jump was measured to evaluate the participants' power, which is the ability to exert muscle force quickly. The students were required to jump horizontally, as far as possible, using a two-footed takeoff and landing. They did this twice, and the best test trial was used in this study. Both skill-related PF tests showed acceptable validity and reliability among adolescents in a previous research [46].

2.3. Procedures

This cross-sectional research was undertaken in the spring 2017 semester. The study was approved by the university's institutional review board based on the Declaration of Helsinki (Project identification code: SHU-2017-00145). The researchers met with the participating school principals and PE teachers, who permitted and supported the study's data collection. All participants were offered written informed consent and children's assent forms; those participants who turned in the consent forms

received a detailed explanation of the study's purpose, the process of data collection, potential benefits and risks, and withdrawal rights. The students were also informed that all of their answers would remain anonymous and confidential to encourage them to answer truthfully. Three bilingual translators translated all the survey items from English to Chinese and then re-translated them from Chinese to English to enhance the validity of the study measures used in this study. The students spent approximately 20–30 min completing all surveys during regularly scheduled PE classes. The graduate research assistants provided the participants, if requested, with an additional guide to ensure students' understanding of the questions in the survey. The PE teachers in the participating schools administered the PF tests (i.e., 50-meter dash and standing long jump). The trained research assistants visited each school and observed the fitness tests to ensure that the procedures complied and the testing were reliable.

2.4. Data Analysis

Initially, the raw data of all items was screened for accuracy, missing data, normality, and outliers. Three steps were taken using the statistics program SPSS version 25.0 for Mac to analyze the final data in this study. First, confirmatory factor analysis using SEM was carried out to explore the validity and reliability of the 3×2 AGQ. Second, Cronbach's α coefficients and Pearson product-moment correlations were calculated to investigate the internal consistencies of the measures and bivariate correlations among the study variables. Third, three stepwise multiple regression analyses were applied to investigate the predictive strengths of six goal orientations on PA and PF (50-meter dash and standing long jump) among high school students.

3. Results

3.1. Correlation Analysis

The Pearson product-moment correlation results revealed that three approach goal orientations (task, self, and other) were statistically significantly associated with PA, 50-meter dash, and standing long jump (r_s from -0.10 to 0.27 , all $p < 0.01$). Three avoidance goal orientations (task, self, and other) were also weakly connected with PA (r_s ranged from 0.10 to 0.13 , all $p < 0.01$), but not with PF performance (50-meter dash and standing long jump) (Table 1). In addition, PA was negatively related to 50-meter dash, but was positively associated with standing long jump.

Table 1. Descriptive statistics, internal reliabilities, and correlations in study variables ($N = 792$).

Variables	M \pm SD	1	2	3	4	5	6	7	8	9
1. Task-approach	5.29 \pm 1.18	(0.89)								
2. Self-approach	5.28 \pm 1.18	0.85 **	(0.90)							
3. Other-approach	4.76 \pm 1.37	0.69 **	0.71 **	(0.95)						
4. Task-avoidance	5.14 \pm 1.25	0.51 **	0.50 **	0.53 **	(0.91)					
5. Self-avoidance	5.11 \pm 1.32	0.52 **	0.52 **	0.53 **	0.87 **	(0.96)				
6. Other-avoidance	5.03 \pm 1.34	0.51 **	0.50 **	0.58 **	0.81 **	0.89 **	(0.96)			
7. PA	2.26 \pm 0.78	0.27 **	0.27 **	0.27 **	0.10 **	0.11 **	0.13 **	(0.79)		
8. 50-meter dash	8.28 \pm 1.26	-0.10 **	-0.12 **	-0.13 **	0.01	0.01	0.04	-0.24 **	-	
9. Standing longjump	184.54 \pm 41.45	0.14 **	0.14 **	0.13 **	0.01	0.02	0.03	0.23 **	-0.52 **	-

Note: M = mean; SD = standard deviation; PA = physical activity; the diagonal in parentheses displays the Cronbach's α values; ** $p < 0.01$.

3.2. Stepwise Multiple Regression

The predictive function of PA and PF performance was derived by three stepwise regression analyses with six independent variables (3×2 achievement goals). The results indicated that other-approach goals ($\beta = 0.19$), self-approach goals ($\beta = 0.18$), and task-avoidance goals ($\beta = -0.09$) significantly predicted the students' PA, $F(3, 788) = 26.96$, $p < 0.001$, $R^2 = 0.09$. Other-approach goals ($\beta = -0.19$) and self-avoidance goals ($\beta = 0.10$) were significant predictors of the 50-meter dash, F

(2, 789) = 8.42, $p < 0.001$, $R^2 = 0.03$. The self-approach goal ($\beta = 0.14$) was the only predictor for the standing long jump, $F(1, 790) = 12.39$, $p < 0.001$, $R^2 = 0.02$ (Table 2).

Table 2. Results of stepwise multiple regression analyses ($N = 792$).

Study Variables	Predictors	R^2	β	t
PA	Other-approach	0.09 ***	0.19 ***	3.85
	Self-approach		0.18 ***	3.72
	Task-avoidance		-0.09 *	-2.18
50-meter dash	Other-approach	0.03 ***	-0.19 ***	-4.11
	Self-avoidance		0.10 *	2.21
Standing long jump	Self-approach	0.02 ***	0.14 ***	3.52

Notes. PA = physical activity; β = standardized regression coefficients. *** $p < 0.001$, * $p < 0.05$.

4. Discussion

Guided by the latest 3×2 achievement goal model, the purpose of this study was to understand the roles of the six goal orientations on PA and PF among Chinese high school students. This study was the first attempt to examine the influence of 3×2 achievement goal orientations on high school students' PA and PF using the latest 3×2 achievement goal model as a framework. Previous studies predominantly focused on examining PA using 2×2 achievement goal constructs in adolescents [34,47] or using 3×2 achievement goal constructs in college students [32,38]. Examining clear distinctiveness of various achievement goals using the up-to-date 3×2 achievement goal model in adolescents was needed to add to the literature on the effects of detailed 3×2 goal orientations on PA and PF among adolescents. [31,48]. Therefore, the broad scope of the potential advantages from this study may provide insights to highlight the importance of goal orientations and for developing effective PA interventions to improve high school students' PA and PF in school settings.

Stepwise multiple regression analysis revealed that task-avoidance, self-approach, and other-approach goal orientations were significant predictors of PA. These findings are partially consistent or inconsistent with results from previous studies about the relationship between achievement goals and PA. The other-approach goal was a significant predictor of Chinese adolescents' PA. The finding is consistent with empirical studies suggesting a positive association between a performance-approach goal and PA among college students using the 2×2 achievement goal framework [49]. Lochbaum and colleagues (2013) revealed that performance-approach goal predicted long-term maintenance in exercise participation. It seems that the other-approach goal provides more positive and motivationally beneficial effects on adolescents' participating in PA compared to elementary-school-aged children [50]. Zhang and colleagues (2016) as well as Lochbaum and colleagues (2013) indicated that mastery-avoidance goals were unrelated to PA among college students using the 2×2 achievement goal model, whereas the findings of this study showed that task-avoidance and self-approach goals using the 3×2 achievement goal model significantly predicted PA. High school students with higher task-avoidance and self-approach goals were likely to be more physically active compared to college students. This result also provides a critical suggestion that examining task-based and self-based achievement goals could allow us to deeply understand students' mastery goals, and could provide more precise and clearer information about variants of mastery-based achievement goals [33,51]. Generally, mastery-based achievement goals are related to positive motivational patterns and outcomes, showing that adolescents with higher mastery-based achievement goals often demonstrate higher engagement and effort in PA during PE [52,53]. However, it was unclear whether results from the mastery-based achievement goals would be task-based goals, self-based goals, or both because individuals' engagement in PA may be driven by achievement goals focusing on one's action and task (task-based) or focusing on comparing one's past, current, and future performances (self-based) [33]. Thus, the findings of this study using the 3×2 achievement goal model might add meaningful empirical evidence that high school students

focus more on how they are doing related to their past or future potential and how they are trying to avoid performing poorly when participating in PA.

Another important finding of this study was that other-approach, self-avoidance, and self-approach goal orientations significantly influenced high school students' PF outcomes such as 50-meter dash and standing long jump. The results showed that other-approach and self-avoidance goals significantly contributed to the 50-meter dash, but only self-approach goals significantly predicted standing long jump. The reason for these results may be because different PF outcomes have different psychological needs [54,55]. The 50-meter dash asks students to focus on the attainment of the individual's own task compared to others and avoid performing worse than before. In comparison, the standing long jump requires students to focus on the attainment of the individual's task compared to previous experience and perform better than before. Thus, self-approach goals should be important to predict standing long jump in this study.

Empirical evidence supported that mastery-approach and performance-approach goals are strongly associated with cardiorespiratory fitness using the 2×2 achievement goal model [56]. The current research using the 3×2 achievement goal model also supported the relation between the other-approach (i.e., performance-approach) and the 50-meter dash, which is one of the cardiorespiratory fitness tests. We found that self-avoidance goals strongly predicted Chinese adolescents' 50-meter dash performance, which contradicted results from previous findings of maladaptive patterns between mastery-avoidance and health-related PF outcomes [56,57]. This may be due to different achievement goals when participating in sport activities or physical tasks based on cultural differences between the United States and China [58] because we collected data among Chinese high school students. In addition, the 3×2 achievement goal construct split the mastery-based goals into two dimensions (task-based and self-based goals), providing more precise differentiated mastery-based goals than the 2×2 achievement goal constructs [31]. Based on these findings, we recommend that future studies examine the relationship between adolescents' achievement goal orientations and PF employing the 3×2 achievement goal model to accurately clarify their mastery-based goal orientations.

This study has several important limitations. The first limitation was the use of a self-reported PA measure. Further investigations are necessary to use an objective tool, such as accelerometers or pedometers, to track students' PA to reduce the potential personal bias in measuring PA. Second, the variances explained by stepwise multiple regression models were relatively low, but we also used a large sample size in this study. In addition, using structural equation modeling (SEM) has more advantages than multiple regression analyses for examining the predictive strengths of six goal orientations on PA and PF with good Type 1 error controls. Third, other psychosocial variables should be included (i.e., motivational climate and social support) in future studies to examine various psychosocial variables on students' PA and PF. Finally, the 50-meter dash and standing long jump were the sole performance-related PF outcomes measured in this study; thus, more research is needed to explore the relations between students' goal orientations and other health-related components of PF, such as flexibility, muscular fitness, and body composition, using the 3×2 achievement goal model as a framework.

5. Practical Implications

The results of the present study have many practical implications. For example, PE teachers or practitioners can apply the latest wearable fitness technology (e.g., activity trackers such as accelerometers or pedometers) to measure students' PA objectively and display students' activity levels (e.g., heart rate, calories burned, and steps taken) on a connected big screen during PE classes or extra PA programs. This application allows students to monitor all their peers' activity levels and try outperforming their peers (other-approach goals). In addition, PE teachers or practitioners can provide students with PF-related exercise logs to encourage them to record their PF performances. In doing so, students can set up personal goals based on their previous PF performance scores (self-approach goals).

6. Conclusions

Collectively, we provided further empirical evidence validating the 3 × 2 achievement goal model in PE settings among high school students. The findings contribute to the literature by applying the latest 3 × 2 achievement goal model to explore Chinese high school students' achievement goal orientations in PA and performance-related PF outcomes. The research findings provide empirical evidence and a new perspective for offering effective PA programs and interventions in the high school setting. Fostering self- and other-approach-oriented environments with developmentally appropriate content in PE may hold implications for enhancing high school students' PA and PF.

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