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## Attitude and Attitudinal Structures Toward Physical Education and Their Influences on Physical Activity Behavior

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### Abstract

**Objectives:** The purpose of this study was to examine middle and high school students' cognitive and affective attitude and their cognitive-affective attitudinal structures toward physical education (PE). The effects of cognitive and affective attitude and attitudinal structures on physical activity (PA) in PE and outside of school were also examined. **Methods:** 1773 Chinese middle and high-school students participated in this study. SEM, Chi-square test, ANOVAs, and Contingency tables were adopted to address the research questions. **Results:** The results showed that most students (>90%) were holding positive cognitive and affective attitude toward PE. Students' affective attitude significantly influences their PA in PE and outside of school. Most students were holding the positive cognitive-positive negative attitudinal structure toward PE. **Conclusions:** All these findings lay important foundations for future theoretical advancement about attitude toward PE and provide guidance for PE teachers on attitude intervention and PA promotion.

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**Keywords:** Attitude consistency, attitude ambivalence, exercise promotion, Chinese students

## Introduction

Approximately 40 years ago, John Goodlad (1984) observed in his work "A Place Called School" that, in comparison to other school subjects, physical education (PE) was perceived by students as highly enjoyable yet deemed less significant. This suggests a potential ambivalence in students' attitudes towards PE as a school subject, indicating that while students find PE enjoyable, they may not regard it as valuable. Goodlad's (1984) observations align well with the multicomponent model of attitude which categorizes attitude into two distinct components: cognitive/instrumental and affective attitudes (Maio, Haddock, & Verplanken, 2019; Subramaniam & Silverman, 2000). Cognitive attitude refers to one's overall instrumental evaluations on the attributes of an object, such as the belief in PE's usefulness or value. Conversely, the affective attitude pertains to one's emotional responses towards an object, with a positive affective attitude reflecting enjoyment or fun associated with PE.

Within this theoretical framework, Goodlad's findings suggest a discrepancy between the cognitive and affective components of students' attitudes towards PE. The concept of attitudinal structure, as delineated by the multicomponent model of attitude, is crucial for understanding these attitudes (Maio et al., 2019). Individuals may exhibit varied attitudinal structures towards an object; for example, some students may view PE as both significant (positive cognitive attitude) and enjoyable (positive affective attitude), whereas others may find it enjoyable (positive affective attitude) yet not worthwhile (negative cognitive attitude). These differing attitudinal structures—positive cognitive-positive affective versus negative cognitive-positive affective—highlight the complexity of students' perceptions towards PE. Goodlad's findings predominantly suggest that the prevailing attitude among students towards PE is characterized by a positive affective but negative cognitive attitudinal structure.

## Attitudinal Statuses and Structures toward PE

Many studies have explored students' attitudes towards PE (Silverman, 2017). However, there has yet to be a comprehensive examination of the nuanced attitudinal structures students hold towards PE and the roles these structures play. Traditionally, research in this area has employed a variable-centered approach, which elucidates

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average student attitudes towards PE—both cognitive and affective—and their correlations with other factors like physical activity, fitness, perceived competence, and achievement (Howard & Hoffman, 2018). While useful, this method falls short in delivering insights into individual perspectives, such as the percentage of students with positive or negative attitudes towards PE or those combining positive affective attitudes with negative cognitive ones. This gap limits our understanding of how cognitive and affective attitudes interact on a personal level, given that students may simultaneously harbor distinct combinations of these attitudes.

Attitudes towards PE can be broadly classified into three statures: positive, neutral, or negative. When we apply this classification to both cognitive and affective dimensions, we theoretically identify nine possible attitudinal structures towards PE (see Figure 1 for these nine structures). Each student is likely to align with one of these structures. While current research provides insights into average attitudes and demographic variations, it offers little on the distribution of students across different cognitive and affective attitude statuses, or the specific combinations of these nine attitudinal structures. This lack of detailed information hampers a comprehensive understanding of student attitudes towards PE.

### Measurement of PE Attitude

Attitude is a pivotal psychological concept within social psychology (Maio et al., 2019). The semantic differential scale is recognized as one of the most impactful and commonly utilized direct measures of attitude in this field. This method has also been adopted in educational psychology to assess students' attitudes towards various

school subjects, including mathematics and chemistry (Cheung, 2009; McCallon & Brown, 1971). In PE, however, the preferred instruments for gauging attitudes have predominantly been Likert scale-based, developed by Stephen Silverman and his team (e.g., Subramaniam & Silverman, 2000; Phillips & Silverman, 2012). There have been limited attempts to employ semantic differential scales to measure students' attitudes towards PE. This study aims to utilize the semantic differential approach to evaluate students' cognitive and affective attitudes towards PE, citing four main reasons for this choice. Firstly, this approach maintains consistency with the foundational practices of social psychology and related fields, such as science education. More critically, this study concentrates on students' attitudes towards PE as a school subject, whereas existing Likert scales primarily assess attitudes towards PE teachers and curricula, rendering them less suitable for our objectives. Thirdly, the semantic differential scale's use of bipolar adjective pairs (e.g., useful/useless, interesting/boring) simplifies the classification of attitudes into positive, neutral, or negative categories. This simplicity enhances the analysis of students' attitudinal positions and structures concerning PE. Lastly, verifying previous research findings through an alternative measurement method is essential for the robustness of research. While most quantitative data on PE attitudes derive from Likert scales, corroborating these results via the semantic differential method is crucial. Therefore, this study also aims to reaffirm past research findings using the semantic differential approach, with a focus on exploring differences in PE attitudes across gender and educational levels, topics that have been extensively discussed in the literature (Silverman, 2017).

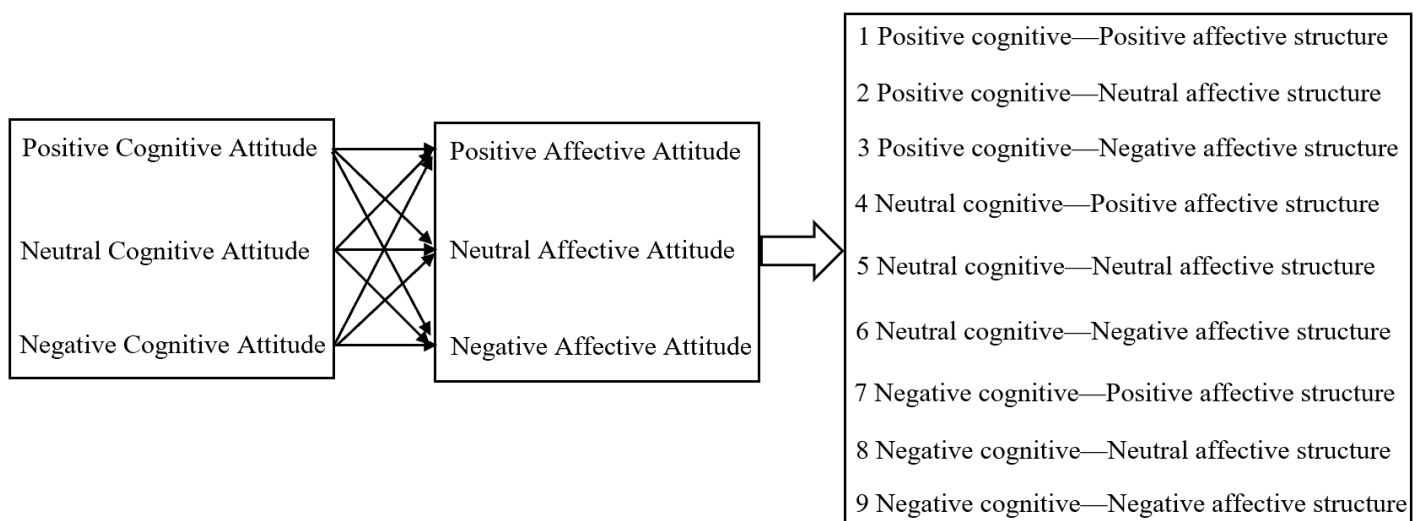


Figure 1. Nine cognitive-affective attitudinal structures that students may hold

## **Gender, Grade/School Level, and PE Attitude**

Many studies have investigated students' attitudes towards PE across various educational stages, including upper elementary, middle, and high schools (Silverman, 2017). These studies, often utilizing original or adapted Likert scales developed by Silverman and his team, consistently reveal that both boys and girls across different school levels exhibit moderately to highly positive cognitive and affective attitudes towards PE. While significant variances in attitudes have been noted across different grade levels, indicating a general decline in positivity towards PE with age, gender differences have not been significantly observed (Hu et al., 2014; Mercier et al., 2017; Subramaniam & Silverman, 2007).

## **PE Attitude and PA Behavior**

A critical area yet to be fully explored in PE attitude research is the impact of students' attitudes towards PE on their PA behaviors. Encouraging students to engage in PA is a primary objective of PE programs (Ennis, 2017), aiming to not only enhance PA within school settings but also promote active lifestyles outside school. Understanding how students' attitudes towards PE influence their PA behaviors is essential for achieving this goal. The theory of planned behavior posits that attitude, along with subjective norms and perceived behavioral control, predicts one's behavioral intentions and behaviors (Ajzen, 1991). According to this theory, a more positive attitude toward an object tends to lead to more behavioral actions related to this object. Based on this theory, students' attitude toward PE should positively influence their PA behavior in PE.

Integrating principles from the theory of planned behavior and self-determination theory, the trans-contextual model explains how motivation within educational settings can affect behaviors outside of school (Hagger & Chatzisarantis, 2016; Wang, 2022). Studies have shown that students' motivation in PE, driven by self-determination, positively correlates with PA behaviors beyond school through influencing their motivational and social-cognitive perceptions of PA. Despite originating from different theoretical backgrounds, cognitive and affective attitudes towards PE and self-determined motivational types (such as identified regulation and intrinsic motivation) share conceptual similarities. Identified regulation, reflecting students' instrumental beliefs about PE, closely aligns with the notion of cognitive attitude. Similarly, intrinsic motivation, based on the enjoyment and pleasure derived from PE, parallels the concept of affective attitude. Given the trans-contextual model's findings that self-determined motivation positively impacts PA outside of school, it is reasonable to infer that students' cognitive and affective attitudes towards PE could similarly influence their PA behaviors beyond the school environment.

Our literature review identified only three studies examining the relationship between PE attitudes and PA behavior, focusing solely on overall attitudes without distinguishing between cognitive and affective components. Two of these studies, concentrating on PA outside of school, identified a modest but significant correlation between PE attitudes and out-of-school PA (Chung & Phillips, 2002; Kjonniksen, Fjortoft, & Wold, 2009). In contrast, one study investigating daily PA found no significant link between PE attitudes and daily PA behaviors (Mercier, Simonton, Centeio, Barcelona, & Garn, 2023).

## **The Present Study**

As outlined above, this study was guided by three primary objectives. The first goal was to validate previous findings using the semantic differential method. The second objective aimed to assess students' cognitive and affective attitudes towards PE, as well as their combined cognitive-affective attitudinal structures. The third goal sought to explore the impact of these cognitive and affective attitudes on students' PA levels both during PE classes and outside school. To tackle these objectives, the study employed both variable-centered and person-centered analytical approaches. The specific research questions were as follows:

### **Variable-centered Questions:**

(1) To what extent did gender and age influence students' cognitive and affective attitude toward PE? (2) To what extent did students' cognitive and affective attitude toward PE influence their PA level in PE and outside of the school? These two questions were combined to form a hypothesized model as shown in Figure 2 and were addressed by testing this hypothesized model.

### **Person-centered Questions:**

(3) What were the proportions of students who were holding positive, neutral, or negative cognitive/affective attitude toward PE and were there any differences in terms of gender and school level? (4) What were the proportions of students who were holding each of the cognitive-affective attitudinal structures toward PE and were there any differences in terms of gender and school level? (5) To what extent did it differ in PA in PE and PA outside of school for students with different cognitive/affective attitude statuses? (6) To what extent did it differ in PA in PE and PA outside of school for students with different cognitive-affective attitudinal structures?

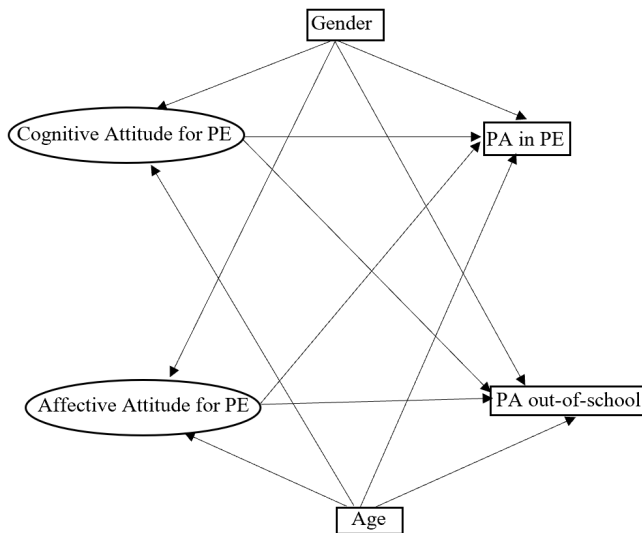


Figure 2. Hypothesized Model for the First Two Research Questions

## Methods

### Participants

Nine middle schools and five high schools were randomly selected from three districts of Shanghai, China. Seven middle schools and three high schools agreed to participate. In Shanghai, middle schools include 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, and 9<sup>th</sup> grade and high schools include 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> grade. All principals of these schools requested to exclude 9<sup>th</sup> or 12<sup>th</sup> grade students from this study and four middle school principals requested to exclude 6<sup>th</sup> grade. Based on these requests, this study only focused on 7<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup>, and 11<sup>th</sup> grade students. Two or three classes were randomly selected from each grade of the middle schools and three or four classes were selected from each grade of the high schools. A total of 1937 students were invited to participate in the study; 88 did not return signed parent consent or assent form and were excluded from this study. A total of 1849 students (1065 middle school students and 784 high school students) participated in this study. Of these participants, 76 (4%) were excluded because of the missing data due to absences. A total of 1773 students (1033 middle school students and 740 high school students) provided complete data sets for this study. Among them, 50.6% ( $n=897$ ) were male and 49.4% ( $n=876$ ) were female. The age ranged from 12 to 19 years old ( $M=15.09$ ,  $SD=1.86$ ). This study was reviewed and approved by the University Institutional Review Board. Signed parent consent and assent forms were obtained from all participants.

### Variables and Measures

*Cognitive and affective attitude toward PE.* Students' cognitive and affective attitude toward PE were measured

using a 7-point semantic differential scale. Cognitive attitude was measured using three bipolar adjectives—important/unimportant, valuable/worthless, and useful/useless. Affective attitude was measured using the following three bipolar adjectives: exciting/boring, enjoyable/unenjoyable, and pleasant/unpleasant. This semantic differential scale was preceded by the statement “I think/feel physical education as a school subject is...”. The average score of the three bipolar scales was used to represent students' cognitive or affective attitude toward PE.

The content of the scales (the bipolar adjectives and the preceding statement) were developed and agreed on by a 7-people expert panel—two PE associate/assistant professors, one associate professor in exercise psychology, two high school PE teachers, and two middle school PE teachers. These six pairs of bipolar adjectives were selected based on review of previous attitude literature and existing attitude measures. Ten students (five from middle school and five from high school) were recruited to review the developed scales. All of them indicated that the scales were clear and understandable.

A pilot study was conducted to determine the reliability and validity of the semantic differential scale. A convenient sample of 67 middle school and 59 high school students completed the scale. Acceptable validity and reliability were found for middle school (construct validity:  $\chi^2=19.74$ ,  $df=8$ ,  $p<.01$ ;  $TLI=.94$ ;  $CFI=.97$ ;  $SRMR=.03$ ; Cronbach's alpha: cognitive attitude=.88, affective attitude=.94) and high school students (construct validity:  $\chi^2=22.24$ ,  $df=8$ ,  $p<.01$ ;  $TLI=.96$ ;  $CFI=.98$ ;  $SRMR=.01$ ; Cronbach's alpha: cognitive attitude=.97, affective attitude=.94).

*PA in PE and outside of the school.* Students' PA level in PE and outside of the school were measured using the question items adapted from The Physical Activity Questionnaire for Older Children and Adolescents (Kowalski, Crocker, & Donen, 2004). *PA in PE* was measured using one item: “In the last 7 days, during your physical education classes, how often were you very active (e.g., playing hard, running, jumping, throwing)”. *PA outside of the school* was measured by three items: “In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were very active?”, “In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were very active?”, and “On the last weekend, how many times did you do sports, dance, or play games in which you were very active?”. All items were scored using a 5-point scale. The average scores of the items for PA outside of the school were used to represent students PA level outside of the school.

These question items were translated from English to Chinese by two bilingual translators independently. Both of them hold a doctoral degree and are specializing in the area of physical education or exercise psychology. The

translation process was completed according to the self-report measures translation guidelines (Beaton, Bombardier, Guillemin, & Ferraz, 2000). Firstly, one translator did the forward-translation and the other did the backward-translation. The backward-translated version was then compared with the original English version. Any inconsistencies were discussed and revised until both translators agreed. Secondly, to check the readability and face validity of the translated Chinese version questionnaire, six in-service physical education teachers (three middle school and three high school) and ten students (five middle school and five high school) were recruited to review the translated measures. The questionnaire was revised based on their responses and suggestions. For example, some specific physical activity examples (e.g., running, jump rope, biking) that Chinese middle and high school students usually do were added in the questionnaire. All of them indicated that the final version of the measure was clear and understandable for middle and high school students.

### Data Collection

The data was collected at the beginning of the PE class with the assistance of PE teachers. Students' cognitive and affective attitude toward PE data were first collected and physical activity questionnaire was administered five to seven days later. All questions were addressed immediately by the researchers during the data collection.

### Data Reduction

*Cognitive attitude status toward PE.* Students' cognitive attitude status was categorized into three categories—positive, neutral, and negative attitude—based on their average score on the cognitive attitude scales above. Students with a score larger than 4 were categorized into the positive cognitive attitude group, equal to 4 into the neutral cognitive attitude group, and less than 4 into the negative attitude group.

*Affective attitude status toward PE.* Students' affective attitude status was also categorized into three categories—positive, neutral, and negative attitude—based on their average scores on the affective attitude scales above. Students with a score larger than 4 were categorized into the positive affective attitude group, equal to 4 into the neutral affective attitude group, and less than 4 in the negative affective attitude group.

*Cognitive-affective attitudinal structures.* Based on students' cognitive and affective attitude status, every student's cognitive-affective attitudinal structure was identified and coded based on the structure code in figure 1.

### Data Analysis

Four confirmative factor analysis (CFA) was conducted first to establish the baseline model of the cognitive and affective attitude scales for each of the four groups (two gender groups and two school level groups). Next, two sets of measurement invariance tests were conducted for school level and gender, respectively, to ensure that it is legitimate to compare the means of cognitive and affective attitude between different school levels and gender. Hu and Bentler's (1999) fit indices cutoff criteria were used to determine the model fit (chi-square, Standardized Root Mean-square Residual [SRMR]  $\leq .09$ , Tucker Lewis Index [TLI]  $\geq .95$ , and Comparative Fit Index [CFI]  $\geq .95$ ). For model comparison,  $\Delta$ CFI was used to determine the level of measurement invariance across groups ( $\Delta$ CFI  $< .01$ , Cheung & Rensvold, 2002). All these analyses were conducted using IBM SPSS Amos 22.0.0.

To address the first two research questions, the model shown in figure 2 was tested using structural equation modelling (SEM) analysis through IBM SPSS Amos 22.0.0. To answer the third question, two contingency tables were calculated for cognitive and affective attitude status by gender and school level, respectively, and chi-squares tests were conducted to determine the group differences on the proportion of students in each cognitive and affective attitude status toward PE. To address the fourth question, two contingency tables were calculated for cognitive-affective attitudinal structures by gender and school level, respectively, and chi-squares tests were conducted to determine the group differences on the proportion of students in each cognitive-affective attitudinal structure toward PE. For the fifth and sixth research questions, one-way ANOVAs were conducted to determine the differences in PA in PE and out-of-school PA between students in different cognitive attitude status groups, affective attitude status groups, and cognitive-affective attitudinal structure groups, respectively. The answers to the fifth and sixth research questions are only explorative and descriptive because of the dramatically different group sizes. All these analyses were conducted using IBM SPSS 28.0.1.1.

## Results

### Measurement Invariance Results

Table 1 shows the results of the baseline model and internal consistency reliability for each group. These results suggest that the measures of cognitive and affective attitude have good psychometric properties for each group. Table 2 shows the measurement invariance test results for school level and gender. These results suggest that all four levels of

measurement invariance (configural, metric, scalar, and residual variance) were achieved. These results indicate that it is valid to compare the means of cognitive and affective attitude across the school level and gender groups.

Table 3 shows the basic descriptive statistics and bivariate correlations of all variables. The SEM results show

that the data fit well with the model shown in figure 2 ( $\chi^2 = 138.58$ ,  $df = 25$ ,  $p < .01$ ;  $CFI = .99$ ;  $TLI = .99$ ;  $SRMR = .01$ ). Figure 3 shows all the standardized path coefficients in the model.

**Table 1. CFA and internal consistency reliability results**

Group	Chi-square	CFI	SRMR	TLI	Factor loadings	Cronbach $\alpha$	
						Cognitive	Affective
Middle school	$\chi^2 = 123.724$ , $df = 8$ , $p < .01$	.983	.020	.967	.89-.94	.93	.94
High school	$\chi^2 = 70.691$ , $df = 8$ , $p < .01$	.990	.010	.982	.91-.97	.96	.95
Male	$\chi^2 = 145.045$ , $df = 8$ , $p < .01$	.981	.013	.964	.91-.96	.95	.96
Female	$\chi^2 = 32.651$ , $df = 8$ , $p < .01$	.996	.008	.992	.88-.94	.93	.94

**Table 2. Measurement Invariance Test Results for School Level and Gender**

	Model	$\chi^2/df$	CFI	SRMR	TLI	Model Comparison	$\Delta CFI$
School Level	A. Configural	194.415/16	.986	.020	.974	--	--
	B. Metric	218.431/20	.985	.019	.977	A vs. B	.001
	C. Scalar	224.887/24	.985	.019	.981	B vs. C	.000
	D. Residuals	326.877/30	.977	.022	.977	C vs. D	.008
Gender	A. Configural	177.696/16	.987	.013	.976	--	--
	B. Metric	201.949/20	.986	.012	.979	B vs. A	.001
	C. Scalar	209.239/24	.986	.012	.982	C vs. B	.000
	D. Residuals	288.630/30	.980	.016	.980	D vs. C	.006

### Cognitive and affective attitude toward PE

*Variable-centered approach results.* Table 3 shows that on average students were holding high levels of positive cognitive attitude ( $M = 6.51$ ,  $SD = .84$ ) and affective attitude toward PE ( $M = 6.36$ ,  $SD = 1.01$ ). It indicates that in general students perceive that PE, as a school subject, is valuable and enjoyable.

*Person-centered approach results.* Table 4 showed that 96% ( $n = 1702$ ) students were holding positive cognitive attitude toward PE, 3.2% ( $n = 56$ ) holding neutral cognitive attitude, and 0.8% ( $n = 15$ ) holding negative cognitive attitude toward PE. For affective attitude toward PE, 94.3% ( $n = 1672$ ) were holding positive attitude, 3.3% ( $n = 59$ ) neutral, and 2.4% ( $n = 42$ ) negative attitude.

**Table 3. Descriptive statistics and bivariate correlations of all variables**

	Mean/SD	Bivariate Correlations		
		1	2	3
1 Cognitive attitude	6.51/.84			
2 Affective attitude	6.36/1.01	.87**		
3 PA in PE	3.91/1.09	.28**	.29**	
4 PA out-of-school	2.54/1.11	.18**	.21**	.35**



**Table 4. The contingency table of cognitive and affective attitude status toward PE by gender**

	Negative cognitive	Neutral cognitive	Positive cognitive	Total
Male	1.2% (11)	3.2% (29)	95.5% (857)	100% (897)
Female	0.5% (4)	3.1% (27)	96.5% (845)	100% (876)
Total	0.8% (15)	3.2% (56)	96.0% (1702)	100% (1773)
Middle school	0.5% (5)	2.3% (24)	97.2% (1004)	100% (1033)
High school	1.4% (10)	4.3% (32)	94.3% (698)	100% (740)
Total	0.8% (15)	3.2% (56)	96.0% (1702)	100% (1773)
	Negative affective	Neutral affective	Positive affective	Total
Male	2.2% (20)	2.9% (26)	94.9% (851)	100% (897)
Female	2.5% (22)	3.8% (33)	93.7% (821)	100% (876)
Total	2.4% (42)	3.3% (59)	94.3% (1672)	100% (1773)
Middle school	2.3% (24)	3.3% (34)	94.4% (975)	100% (1033)
High school	2.4% (18)	3.4% (25)	94.2% (697)	100% (740)
Total	2.4% (42)	3.3% (59)	94.3% (1672)	100% (1773)

**Gender influences on cognitive and affective attitudes toward PE**

*Variable-centered approach results.* Figure 3 showed that gender significantly influenced students’ cognitive attitude (unstandardized path coefficient= -.09,  $p = .03$ ) and affective attitude (unstandardized path coefficient= -.16,  $p < .01$ ) toward PE after controlling for age. It suggests that boys tend to have higher levels of cognitive and affective attitude toward PE.

*Person-centered approach results.* Table 4 shows that contingency table of students’ cognitive and affective attitude status toward PE by gender. The Chi-square tests show that gender did not significantly influence the proportions of students who were holding positive, neutral, and negative cognitive attitude ( $\chi^2 = 3.17$ ,  $df = 2$ ,  $p = .20$ )

and affective attitude ( $\chi^2 = 1.22$ ,  $df = 2$ ,  $p = .55$ ). Boys and girls tend to have similar proportions of students who are holding positive, neutral, and negative cognitive attitude and affective attitude toward PE.

**Age influences on cognitive and affective attitudes toward PE**

*Variable-centered approach results.* Figure 3 shows that age had significant influences on affective attitude toward PE (unstandardized path coefficient= .03,  $p = .03$ ), but did not show significant effects on cognitive attitude (unstandardized path coefficient= .000,  $p = .97$ ) after controlling for gender. These results suggest that older adolescents tend to have higher levels of affective attitude toward PE.

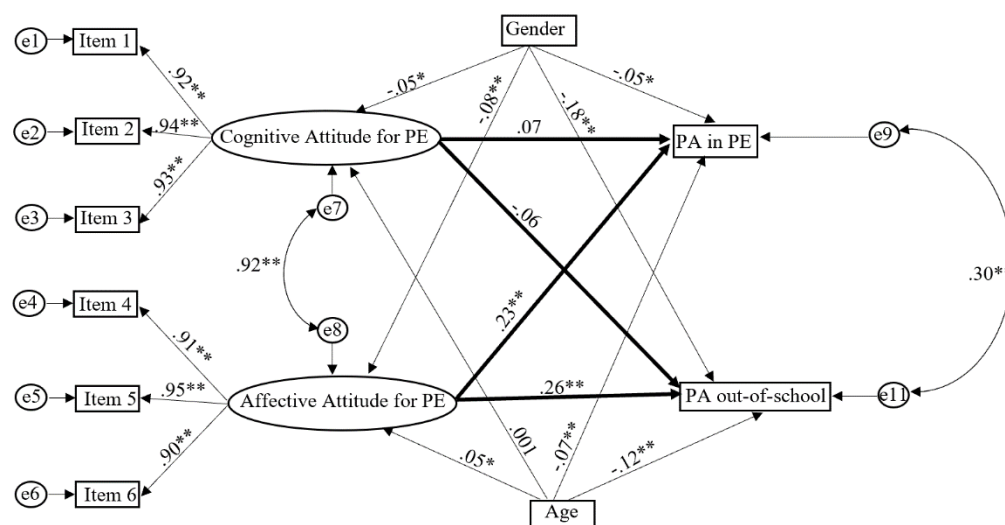


Figure 3. SEM Results

*Person-centered approach results.* Table 4 shows that contingency table of students’ cognitive and affective attitude status toward PE by school level. The Chi-square test showed that there was significant difference for the proportion of students who were holding positive, neutral, or negative cognitive attitude toward PE ( $\chi^2 = 9.67$ ,  $df = 2$ ,  $p = .008$ ). It seemed that more middle school students (97.2%) were holding positive cognitive attitude toward PE than high school students (middle school=97.2%, high school= 94.3%), and less middle school students were holding neutral (middle school=2.3%, high school= 4.3%), and negative

cognitive attitude (middle school=0.5%, high school= 1.4%). There were no significant differences for affective attitude ( $\chi^2 = .033$ ,  $df = 2$ ,  $p = .98$ ).

### Effects of cognitive and affective attitude toward PE on PA level in PE and Out of school

*Variable-centered approach results.* Figure 3 shows that the effects of cognitive attitude were not significant on PA in PE (unstandardized path coefficient= .10,  $p = .32$ ) and PA outside of the school (unstandardized path coefficient= -.08,  $p = .40$ ). The effects of affective attitude were significant on PA in PE (unstandardized path coefficient= .25,  $p < .01$ ) and PA outside of school (unstandardized path coefficient= .29,  $p < .01$ ). All these results indicate that affective attitude toward PE tends to be able to positively influence students' PA level in PE and outside of school, while cognitive attitude tends not to be able to influence students' PA level in these contexts.

*Person-centered approach results.* Table 5 shows the mean and standard deviations of PA in PE, PA in school, and PA outside of school for students with different cognitive and affective attitude status. For cognitive attitude, the one-way ANOVA tests showed significant group differences on PA in PE ( $F_{(2, 1770)} = 24.04$ ,  $p < .001$ ) and PA outside of school ( $F_{(2, 1770)} = 6.40$ ,  $p = .002$ ). Tukey-Kramer post hoc test was used to explore the group differences

because of the unequal group sizes. The post hoc tests showed that for PA in PE, positive cognitive attitude group had significantly higher PA levels than neutral group ( $p < .001$ ) and negative group ( $p = .01$ ). There was no significant difference between neutral group and negative group. For PA outside of the school, positive cognitive attitude group had marginally significantly higher PA level than neutral attitude group ( $p = .001$ ). No other significant differences were found.

For affective attitude toward PE, the one-way ANOVA tests showed that there were significant group differences on PA in PE ( $F_{(2, 1770)} = 38.73$ ,  $p < .001$ ) and PA outside of school ( $F_{(2, 1770)} = 9.10$ ,  $p < .001$ ). The post hoc tests showed that for PA in PE, positive affective attitude group had significantly higher PA levels than neutral group ( $p < .001$ ) and negative group ( $p < .001$ ). There was no significant difference between neutral group and negative group. For PA outside of the school, positive affective attitude group had significantly higher PA levels than neutral group ( $p < .001$ ) and negative group ( $p = .02$ ). There was no significant difference between neutral group and negative group.

One thing that need to be noted is that although we used the most conservative Tukey-Kramer post hoc test, all ANOVA and post hoc test results should be considered as explorative and descriptive in nature because of the dramatically unequal group sizes in these analyses.

**Table 5. Mean and SD of physical activity level for students with different cognitive and affective attitude statuses**

	Negative cognitive (n=15)	Neutral cognitive (n=56)	Positive cognitive (n=1702)	Negative affective (n=42)	Neutral affective (n=59)	Positive affective (n=1672)
PA in PE	3.13/1.41	3.02/1.27	3.95/1.07	3.21/1.14	2.97/1.20	3.96/1.07
PA out-of-school	2.44/.92	2.02/1.12	2.56/1.10	2.11/1.04	2.07/.99	2.57/1.11

### Cognitive-affective attitudinal structures toward PE

Table 6 shows that 93.5% students were holding positive cognitive-positive affective attitudinal structure toward PE, 2.1% holding neutral cognitive-neutral affective structure, 1.3% holding positive cognitive-negative affective structure, and 1.2% holding positive cognitive-neutral affective structure. Less than 1% of students were holding all other structures.

Table 6 shows the contingency table of cognitive-affective attitudinal structures for PE by gender and school level, respectively. The Chi-square tests showed that there were no significant differences on the proportions of students who were holding each of the structures for boys and girls ( $\chi^2 = 10.06$ ,  $df = 8$ ,  $p = .26$ ). There were significant differences for school level ( $\chi^2 = 20.78$ ,  $df = 8$ ,  $p = .008$ ). It seemed that more middle school students were holding

Positive cognitive—Positive affective structure (middle school= 94.1%, high school= 92.7%), Positive cognitive—Neutral affective structure (middle school= 1.5%, high school= 0.8%), Positive cognitive—Negative affective structure (middle school= 1.6%, high school= 0.8%) than high school students, and more high school students were holding Neutral cognitive—Positive affective structure (middle school= 0.2%, high school= 1.5%), Neutral cognitive—Neutral affective structure (middle school= 1.8%, high school= 2.4%), Negative cognitive—Negative affective structure (middle school= 0.4%, high school= 1.2%).

Table 7 shows the mean and standard deviations of PA in PE and PA outside of school for students with different cognitive-affective attitudinal structures for PE. For the ANOVA, students with structure 7 and 8 were excluded because there were less than two students holding each of these structures. The one-way ANOVA tests showed

that there were significant group differences on PA in PE ( $F_{(6, 1764)} = 12.20, p < .001$ ) and PA outside of school ( $F_{(6, 1764)} = 4.17, p < .001$ ). The post hoc tests showed that for PA in PE, students with Positive cognitive—Positive affective structure had significantly higher PA level than students with Positive cognitive—Neutral affective structure ( $p < .001$ ), students with Positive cognitive—Negative affective structure ( $p = .03$ ), and students with Neutral cognitive—Neutral affective structure ( $p < .001$ ). No other significant differences were found. For PA outside of the school, students with Positive cognitive—Positive affective

structure had significantly higher PA level than students with Positive cognitive—Negative affective structure ( $p = .04$ ) and students with Neutral cognitive—Neutral affective structure ( $p = .05$ ). No other significant differences were found.

One thing that need to be noted is that although we used the most conservative Tukey-Kramer post hoc test, all these ANOVA and post hoc test results should be considered as explorative and descriptive in nature because of the dramatically unequal group sizes in these analyses

**Table 6. The contingency table of cognitive-affective attitudinal structures for PE by gender**

	Male	Female	Total	Middle School	High School	Total
1 Positive cognitive—Positive affective structure	93.8% (841)	93.3% (817)	93.5% (1658)	94.1% (972)	92.7% (686)	93.5% (1658)
2 Positive cognitive—Neutral affective structure	0.8% (7)	1.6% (14)	1.2% (21)	1.5% (15)	0.8% (6)	1.2% (21)
3 Positive cognitive—Negative affective structure	1.0% (9)	1.6% (14)	1.3% (23)	1.6% (17)	0.8% (6)	1.3% (23)
4 Neutral cognitive—Positive affective structure	1.0% (9)	0.5% (4)	0.7% (13)	0.2% (2)	1.5% (11)	0.7% (13)
5 Neutral cognitive—Neutral affective structure	2.0% (18)	2.2% (19)	2.1% (37)	1.8% (19)	2.4% (18)	2.1% (37)
6 Neutral cognitive—Negative affective structure	0.2% (2)	0.5% (4)	0.3% (6)	0.3% (3)	0.4% (3)	0.3% (6)
7 Negative cognitive—Positive affective structure	0.1% (1)	0% (0)	0.1% (1)	0.1% (1)	0% (0)	0.1% (1)
8 Negative cognitive—Neutral affective structure	0.1% (1)	0% (0)	0.1% (1)	0% (0)	0.1% (1)	0.1% (1)
9 Negative cognitive—Negative affective structure	1.0% (9)	0.5% (4)	0.7% (13)	0.4% (4)	1.2% (9)	0.7% (13)
Total	100% (897)	100% (876)	100% (1773)	100% (1033)	100% (740)	100% (1773)

**Table 7. Mean and SD of physical activity level for students with different cognitive-affective attitudinal structures.**

	PA in PE	PA out-of-school
1 Positive cognitive—Positive affective structure (n=1658)	3.97/1.06	2.57/1.10
2 Positive cognitive—Neutral affective structure (n=21)	3.00/1.00	2.14/.89
3 Positive cognitive—Negative affective structure (n=23)	3.26/1.01	1.87/.86
4 Neutral cognitive—Positive affective structure (n=13)	3.23/1.30	2.00/1.14
5 Neutral cognitive—Neutral affective structure (n=37)	2.95/1.33	2.03/1.06
6 Neutral cognitive—Negative affective structure (n=6)	3.00/.89	2.06/1.64
7 Negative cognitive—Positive affective structure (n=1)	2.00/--	1.33/--
8 Negative cognitive—Neutral affective structure (n=1)	3.00/--	2.00/--
9 Negative cognitive—Negative affective structure (n=13)	3.23/1.48	2.56/.93

## Discussion

This study aimed to achieve three main goals: (a) to validate prior research on the effects of gender and age on attitudes towards PE using a semantic differential approach, (b) to assess students' cognitive and affective attitude statuses towards PE, as well as their combined attitudinal structures, and (c) to explore how these attitudes influence students' PA both in PE classes and outside of school.

### PE Attitude, Attitudinal Status, and Structures

The research findings indicate that, on average, Chinese middle and high school students hold highly positive cognitive and affective attitudes towards PE, suggesting they generally view PE as both valuable and enjoyable. These findings are consistent with the findings of studies using the Likert scale-based measures from different countries. For instance, Hu and colleagues' (2014) found that on average Chinese middle school students held moderately positive affective and cognitive attitude toward PE curriculum and teachers. Many studies found that US middle/high school students held highly/moderately positive affective and cognitive attitude toward PE (e.g., Mercier et al., 2017; Subramaniam & Silverman, 2007). Studies on Latino, Cypriot, and Portuguese students also found that students held moderate to high levels of positive attitude toward PE (Constantinides & Silverman, 2018; Diaz, 2015; Pereira, Santos, & Marinho, 2020). All these findings tend to imply that in general students tend to hold favorable attitude toward PE and they think that PE is valuable and enjoyable.

The study revealed that approximately 95% of the students exhibited positive attitudes towards PE, with only a small fraction displaying negative views. These findings imply that most Chinese middle and high school students tend to believe that PE, as a school subject matter, is valuable or enjoyable and very few think that PE is not valuable or enjoyable. It also showed that most students (93.5%) held the positive cognitive-positive affective structure toward PE. Few students held other cognitive-affective attitudinal structures. This indicates that most Chinese middle and high school students tend to believe that PE, as a school subject matter, is both valuable and enjoyable. This seems to be inconsistent with the impressions given by Goodlad's (1984) finding that PE was ranked by students as one of the most liking but least important subject matter in school. This inconsistency may come from the methods of measurement. Goodlad's study focused on the relative importance and liking of PE to other school subject matter, while the current study was focusing on the absolute importance and liking of PE. It is understandable that students think that PE is an important/valuable school subject matter, but it is not as

important/valuable as other subject matters (e.g., Math, Science). It is important to note that this study is based on Chinese students and Goodlad focused on US students. Studies focusing on US students and students from other countries are needed to confirm the findings on the attitudinal structures toward PE.

### Influences of Gender

At the variable level, the current study found that gender significantly influenced students affective and cognitive attitude toward PE. These findings seem to be inconsistent with previous findings based on the Likert scales. All these studies, including the study focusing on Chinese students (Hu et al., 2014), did not find significant differences between boys and girls on their attitude toward PE (Mercier et al., 2017; Subramaniam & Silverman, 2007). This inconsistency may be due to different approaches of measuring attitude. But, based on the unstandardized path coefficients from gender to cognitive attitude (-.09) and affective attitude (-.16), we could conclude that even though the influences were significant, the effect sizes were very small. Boys and girls had very similar levels of cognitive and affective attitude toward PE.

At the individual level, the current study found that there were no significant differences between boys and girls for the proportions of students who were holding positive, neutral, or negative cognitive attitude and affective attitude. Boys and girls had similar proportions of students who were holding positive, neutral, and negative cognitive attitude and affective attitude and each of the cognitive-affective attitudinal structures. In summary, at both variable and individual level, gender tends not to influence students' PE attitude.

### Influences of Age/School Level

At the variable level, the current study found that the influence of age on affective attitude was marginally significant with a very small effect size and the influence on cognitive attitude was not significant. This is consistent with most previous findings (Hu et al., 2014; Mercier et al., 2017; Subramaniam & Silverman, 2007). It is important to note that even though a statistically significant age influence on affective attitude is found by many studies, the effect size of the influence is very small for all these studies. These indicate that age has little influence on students' PE attitude.

At the individual level, no significant difference between middle school and high school was found for the proportions of students who were holding positive, neutral, or negative affective attitude. Although it was statistically significant for cognitive attitude, the effect size of the difference was very small. The same pattern was found for the proportions of students holding each of the cognitive-affective attitudinal structures. These indicate that there are

similar proportions of students who are holding each of the cognitive/affective attitudinal statuses and cognitive-affective attitudinal structures toward PE in middle school and high school.

### PE Attitude and PA Behavior

At the variable level, the current study found that only affective attitude toward PE significantly influenced PA in PE and PA outside of school and cognitive attitude did not. At the individual level, the current study also showed that students with positive affective/cognitive attitude had higher levels of PA in PE and PA outside of school than students with neutral or negative affective/cognitive attitude. Students with positive cognitive-positive affective attitudinal structure had the highest PA level in PE and outside of school among all nine attitudinal structures. These findings are consistent with the findings of relevant previous studies (Kjonnixsen et al., 2009; Chung & Phillips, 2002). They, at least partially, support the general propositions related to the general relationship between attitude and behavior in the theory of planned behavior and the trans-contextual model. These findings indicate the affective attitude toward PE may be a stronger factor influencing students' PA in PE and outside of school than cognitive attitude. Increasing students' affective attitude may be an effective way to increase their PA behavior in PE and outside of school.

### Theoretical and Practical Implications

This study fills several important gaps on attitude research in PE and furthers our understanding on adolescent's cognitive and affective attitude toward PE in general as a school subject both from the variable and person-centered perspectives. It delineates the influence of cognitive and affective attitudes toward PE on PA behaviors within PE classes and outside of school. Crucially, it explores the cognitive-affective attitudinal structures of students towards PE and their implications for PA behaviors. These insights form a crucial foundation for theoretical development in attitudes towards PE. Firstly, the study underscores the conceptual necessity of distinguishing between affective and cognitive attitudes due to their distinct influences on PA behaviors. Secondly, it observes that despite a general positive valuation and enjoyment of PE among students, there remains a notable discrepancy between their positive attitudes towards PE and lower actual PA levels, a phenomenon that future theories should aim to elucidate. Practically, the study indicates negligible differences in PE attitudes across genders and educational levels among middle and high school students. It also suggests that enhancing affective attitudes towards PE might be a more

effective strategy in fostering PA behaviors among students than focusing on cognitive attitudes.

### Conclusions and Limitations

These findings of this study suggest that most Chinese middle school and high school students (>90%) think that PE is both valuable and enjoyable. Gender tends not to influence PE attitude and attitudinal structures. Age/school level tends to have little effects on PE attitude and attitude structures. A little bit more middle school students tend to hold a positive PE attitude than high school students. Students' affective attitude toward PE positively influences their PA in PE and outside of school, while their cognitive attitude does not. In general, students who are holding positive cognitive/affective attitude tend to be more active in PE or outside of school than students who are holding negative attitude toward PE. It's noteworthy that PA levels in this study were gauged through self-reported means. Future research employing objective measurements is necessary to validate these findings. Moreover, this study's participant pool consisted of Chinese students, suggesting the possibility of differing attitudinal patterns and structures among students in other nations. Therefore, further research involving diverse international student populations is warranted. Additionally, the investigation into the impact of various attitudinal structures or statuses on PA behavior remains preliminary and descriptive, owing to the considerable disparity in group sizes within our analysis.

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