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# Understanding Students' Cognitive and Affective Attitude and Attitudinal Structures Toward Physical Activity: A Person-Centered Approach

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# Understanding Students' Cognitive and Affective Attitude and Attitudinal Structures Toward Physical Activity: A Person-Centered Approach


## Abstract

*Objectives:* The purpose of this study was to determine the proportions of students who were holding positive, negative, and neutral cognitive/affective attitude and different cognitive-affective attitudinal structures toward moderate-to-vigorous physical activity (MVPA) using a person-centered approach. *Methods:* A total of 3949 students participated in this study (1065 middle-school students, 784 high-school students, and 2100 college students). *Results:* A majority of students were holding positive cognitive (about 94%) and affective attitude (about 85%) toward MVPA. Most students (about 84%) held the Positive cognitive—Positive affective attitudinal structure toward MVPA. School level influenced the proportions of students who were holding different cognitive attitude status, affective attitude status, and cognitive-affective attitudinal structures; gender and body weight status did not significantly influence them. *Conclusions:* This study furthers our understandings on students' attitude and attitudinal structures toward PA. It lays the foundation for the development of physical education curriculum or PA programs that aim at promoting students' PA behavior through changing their PA attitude. Future studies are needed to examine the effects of different attitude statuses and attitudinal structures on PA behavior.

# Understanding Students' Cognitive and Affective Attitude and Attitudinal Structures toward Physical Activity: A Person-centered Approach

## Introduction

One primary goal of physical education (PE) is to help students develop a physically active lifestyle for a lifetime (Society of Health and Physical Educators [SHAPE], 2014). That is, PE should be able to promote students' physical activity (PA) behavior. Attitude-related constructs (the instrumental and affective beliefs) have been conceptualized in many behavior change theories (e.g., Ajzen, 1991; Prochaska, 2008) and many studies have shown that attitude significantly influences PA behavior (Hagger, 2018). Attitude is also one of the frequently targeted variables in PA intervention programs (e.g., Taut & Baban, 2012).

### The Multicomponent Model of Attitude

According to the multicomponent model of attitude, attitude is defined as the overall evaluations on an object (Maio, Haddock, & Verplanken, 2019). It is often conceptualized into three components: cognitive attitude, affective attitude, and behavioral attitude. Cognitive component of attitude refers to people's overall evaluations on their beliefs about the attributes of an/a object/behavior (Maio et al., 2019). Affective component of attitude refers to the overall evaluations on the feelings/emotions associated with an/a object/behavior (Maio et al., 2019). The behavioral component of attitude refers to past behaviors or experiences regarding to approaching or avoiding an object (Maio et al., 2019). Although the behavioral component is theoretically included in the multicomponent model of attitudes, this component was rarely included and examined empirically in attitude research about PA and in many other domains (Hagger, 2018, Crites, Fabrigar, & Petty, 1994; Maio et al., 2019; Verplanken, Hofstee, & Janssen, 1998). This behavioral component of attitude is also not conceptualized in behavior change theories, such as the theory of planned behavior (Ajzen, 1991). Following this tradition, the behavioral component of PA attitude was not included and examined in current study.

Many studies have examined the effects of cognitive and affective attitude on PA behavior and found that both cognitive and affective attitude tend to be able to positively influence PA behavior. It is also shown that affective attitude tends to have stronger effects on PA behavior than cognitive attitude (e.g., Hagger & Chatzisarantis, 2005; Lawton, Conner, & McEachan, 2009; Rhodes & Courneya, 2003). Recently, some studies started to show that affective attitude might moderate the effects of cognitive attitude on PA behavior (Lawson et al., 2009; Rhodes, Fiala, & Nasuti, 2012; Rohde & Gray, 2018). A recent study focusing on this moderation effect found that when people were holding negative affective attitude, their cognitive attitude did not significant influence PA behavior (Wang, Han, Li, & Zhang, 2022). But, when people were holding positive affective attitude, their cognitive attitude started to be able to significantly influence PA behavior and the more positive their affective attitude was, the larger the effects of cognitive attitude on PA behavior. All these findings show the importance role of fostering strong positive affective and cognitive attitude in PA promotion.

To promote students' cognitive and affective attitude toward PA, it is important to first understand the current status of their cognitive and affective attitude. If the valence (positive or negative) of people's affective attitude can make such a difference as shown in Wang et al's

(2022) study, it is important to understand how many students are holding positive or negative affective attitude for PA. This information can guide the development and implementation of PA attitude interventions in PE or PA promotion programs.

Most previous studies involving cognitive and affective attitude toward PA tend to be using a variable-centered approach (e.g., Hagger & Chatzisarantis, 2005; Lawton et al., 2009; Taut & Baban, 2012). This approach is focusing on the average score of variables in a population and the correlational relationships between different variables (Howard & Hoffman, 2018). For instance, variable-centered approach can inform us of the average score of high school students' cognitive attitude and affective attitude toward PA. But, it is unable to inform us of how many high school students are holding positive/negative cognitive/affective attitude and how many high school students are holding positive cognitive attitude and negative affective attitude simultaneously. Person-centered approach can help us address these questions (Howard & Hoffman, 2018). The primary purpose of this study was to understand students' cognitive and affective attitude status and cognitive-affective attitudinal structures using a person-centered approach.

**Cognitive-Affective Attitudinal Structures for PA**

People tend to have different feelings and instrumental beliefs on PA, especially on moderate-to-vigorous physical activity (MVPA, Hagger, 2018; Wang & Hollett, 2021). Some people may think that doing PA is both beneficial and enjoyable, while some other people may believe that doing PA is beneficial but painful/boring. That is, some people may hold positive cognitive attitude and also positive affective attitude, while some other people may hold positive cognitive attitude but negative affective attitude. If we categorize people's cognitive and affective attitude into three categories based on the valence—positive, neutral, negative, logically we can get nine cognitive-affective attitudinal structures as shown in Figure 1. Every individual is holding one of the nine attitudinal structures toward PA.

If we look further into the nature of these nine structures, we can find that some structures are ambivalent structures (e.g., positive cognitive—negative affective structure and negative cognitive—positive affective structure) in which the valence of cognitive and affective attitude is inconsistent with each other. Some structures are unambivalent/univalent structures (e.g., positive cognitive—positive affective structure and negative cognitive—negative affective structure). Attitudinal ambivalence has long been recognized as an important theoretical phenomenon and construct in social and health psychology (Conner & Armitage, 2008;

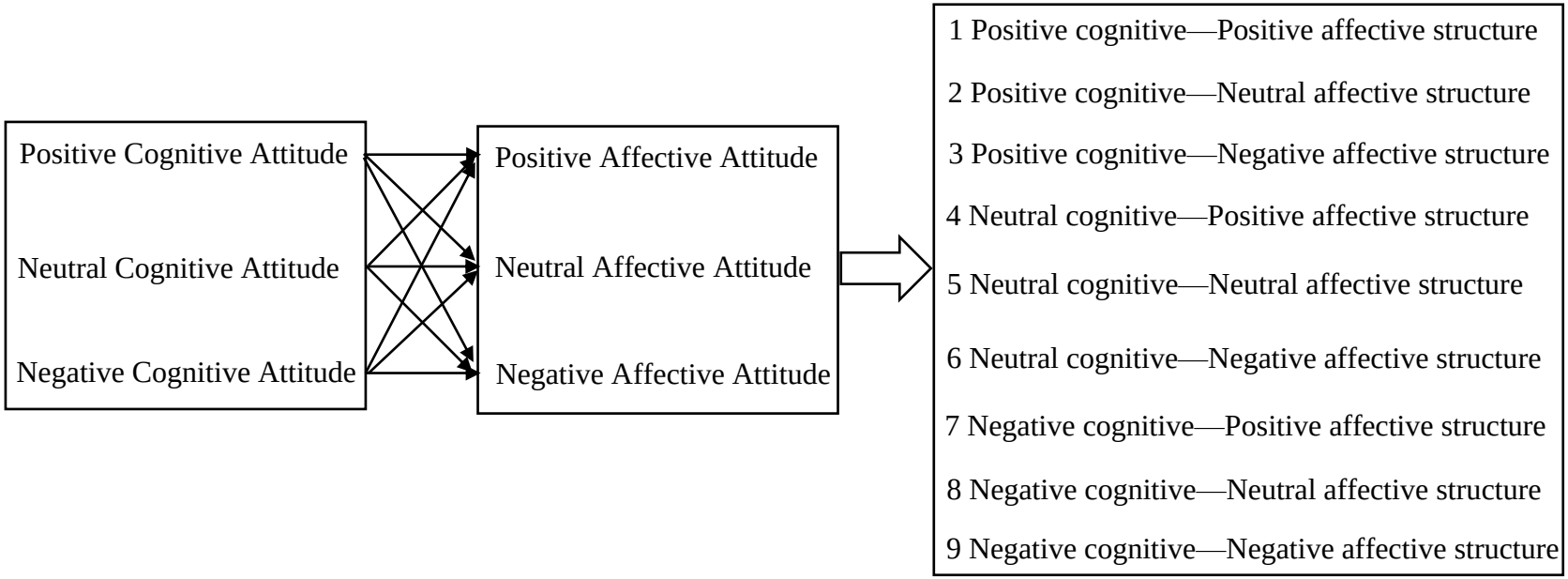


Figure 1. Nine cognitive-affective attitudinal structures that people may hold

Thompson, Zanna, & Griffin, 1995). Many studies have found that ambivalent attitude tends to be unstable, easy to change, and lead to weaker attitude-behavior and intention-behavior relationships than unambivalent attitude (Conner & Armitage, 2008; Thompson et al., 1995). Most previous studies investigating cognitive-affective ambivalence for PA were using a variable-centered approach by converting people's cognitive and affective attitude scores into an ambivalence index through some formula (e.g., Kaplan's formula; Conner, Povey, Sparks, James, & Shepherd, 2003; Conner & Sparks, 2002; Skar, Sniehotta, Araujo-Soares, & Molloy, 2008). It is still unclear about how many people are holding ambivalent or unambivalent cognitive-affective attitudinal structures for PA.

**Body Weight Status and Attitude for PA**

Many studies have shown that body weight status significantly influences people's attitude toward PA (e.g., Deforche, De Bourdeaudhuij, & Tanghe, 2006). Deforche and colleagues (2006) found that obese adolescents had a less positive attitude toward PA than their normal weight and overweight peers. But there were no significant differences for perceived benefits of PA between groups. De Bourdeaudhuij et al. (2005) found that overweight adolescents perceived PA "to be less fun, less good, less healthy, and less smart than their normal weight peers" (p.1100). All these findings suggests that people with different body weight status tend to have different levels of instrumental and affective evaluations on doing PA. Most of these previous studies were using the variable-centered approach to investigate the effect of body weight status on attitude toward PA and most of them did not conceptually distinguish the cognitive and affective attitude. To further understand the effects of body weight status on people's attitude toward PA, it is important to examine it from the person-centered perspective and determine the effects of body weight status on the proportions of students who were holding positive, neutral, or negative cognitive/affective attitude and each of the attitudinal structures.

**Gender and Attitude for PA**

Gender difference is a phenomenon for many variables about PA, such as PA level (e.g., Trost et al., 2002, Azevedo et al., 2007), motivation for PA (e.g., Lauderdale, Yli-Piipari, Irwin, & Layne, 2015), and self-confidence in PA (e.g., Lirgg, 1991). Few studies have investigated gender differences on attitude toward PA. Kamtsios (2010) found that there was no significant gender difference on PA attitude. Smoll and Schutz (1980) found that boys had more positive attitude for PA than girls. Similar to the body weight status studies discussed above, most of these studies used the variable-centered approach and did not distinguish cognitive and affective attitude.

**The Current Study**

This study used a person-centered approach to determine the proportions of students who were holding positive, negative, and neutral cognitive/affective attitude and different cognitive-affective attitudinal structures toward doing MVPA. These proportions were also examined for students with different gender and body weight status in different school levels (middle school, high school, and college level).

This study fills two important gaps in PA attitude research. First, previous studies inform us that on average students are holding positive cognitive and affective attitude toward PA. The current study furthers our understanding by determining what proportions of students are holding each of the attitudinal statuses (positive, neutral, negative) in terms of cognitive and affective

attitude toward PA. This information lays the foundation for identifying students who are most needed to be intervened on their attitude toward PA. Secondly, cognitive attitude and affective attitude function together at the individual level. People's cognitive attitude status may not be consistent with their affective attitude status toward PA (e.g., some people hold positive cognitive attitude but negative affective attitude toward PA). That is, people may hold different cognitive-affective attitudinal structures toward PA. This is a phenomenon that haven't been understood yet in PA attitude. The current study systematically examined the proportions of students who were holding each of the attitudinal structures. This information lays the foundation for further examining attitudinal ambivalence phenomenon in PA attitude and the effects of different attitudinal structures on PA behavior.

The following are the specific research questions of this study:

*Cognitive and affective attitude status:*

(a) What were the proportions of students who were holding positive, neutral, or negative cognitive/affective attitude toward MVPA in middle school, high school, and college, and were there differences for different school levels?
(b) What were the proportions of students with different weight status who were holding positive, neutral, or negative cognitive/affective attitude in middle school, high school, and college, and were there differences for students with different weight status?
(c) What were the proportions of boys/girls who were holding positive, neutral, or negative cognitive/affective attitude in middle school, high school, and college, and were there differences for boys and girls?

*Cognitive-affective attitudinal structures:*

(d) What were the proportions of students who were holding each of the cognitive-affective attitudinal structures toward MVPA in middle school, high school, and college, and were there differences for different school levels?
(e) What were the proportions of students with different weight status who were holding each of the cognitive-affective attitudinal structures in middle school, high school, and college and were there differences for students with different weight status?
(f) What were the proportions of boys/girls who were holding each of the cognitive-affective attitudinal structures in middle school, high school, and college and were there differences for boys and girls?

## Methods

### Participants

The participants were recruited from seven middle schools, three high schools, and twelve 4-year universities in Shanghai, China. The middle schools and high schools were randomly selected from three districts of Shanghai. The universities were recruited based on the researchers' personal connections. A total of 3949 students provided the complete data sets for this study. The sample included 1065 middle school students (male=571 [53.6%], female=494 [46.4%], average age=13.72), 784 high school students (male=372 [47.5%], female=412 [52.5%], average age=17.07), and 2100 college students (male=1169 [55.7%], female=931 [44.3%], average age=20.08). This study was reviewed and approved by the Institutional Review Board of Shanghai University of Sport. Signed parent consent and assent forms were obtained for all minors, and consent forms were obtained for all adults.

## Variables and Measures

*Cognitive and affective attitude.* Students' cognitive and affective attitude toward MVPA were measured using 7-point semantic differential scales (Courneya, Conner, & Rhodes, 2006; Crites, Fabrigar, & Petty, 1994). Specifically, affective attitude was measured using the following three sets of bipolar adjectives: Interesting/boring, enjoyable/unenjoyable, and relaxing/stressful. These bipolar adjectives were preceded by the statement— "I feel that doing MVPA regularly during my leisure time is….". Cognitive attitude was measured using three sets of bipolar adjectives of useful/useless, beneficial/harmful, and wise/foolish. The statement preceding them was "I think that doing MVPA regularly during my leisure time is….".

The measures were translated from English to Chinese. They were also preliminarily validated before data collection. Two bilingual translators did the translation and back-translation according to the translation guidelines of self-report measures (Beaton, Bombardier, Guillemin, & Ferraz, 2000). One of them did the translation and the other did the back-translation. Then, both of them compared the back-translated measures with the original English version. Any inconsistencies and differences were discussed and negotiated until both of them agreed. Secondly, to ensure the face validity and the readability of the measure, four experts (two associate professors in exercise psychology and two associate professors in physical education), 10 middle school students, 10 high school students, and 10 undergraduate students were recruited to review the translated version. During this step, some modifications were made on the translated measure. For example, we changed the format of the measures from the typical 7-point bipolar semantic differential scale table format to six 7-point multiple-choice question format, because some students were not familiar with the semantic differential scale table and found it hard to understand and answer.

Pilot studies were conducted to determine the reliability and validity of these scales. Specifically, a convenient sample of 63 middle school students, 52 high school students, and 43 colleges students completed the measures of cognitive and affective attitude twice with 4-7 days apart. Acceptable reliability and validity were found for middle school (test-retest reliability: cognitive attitude=.81, affective attitude= .83; Cronbach's alpha: cognitive attitude= .89, affective attitude= .93; construct validity: $\chi^2 = 32.30$, $df = 8$, $p < .01$; RMSEA= .22; CFI=.94; SRMR=.07), high school (test-retest reliability: cognitive attitude=.80, affective attitude= .83; Cronbach's alpha: cognitive attitude= .98, affective attitude= .96; construct validity: $\chi^2 = 38.27$, $df = 8$, $p < .01$; RMSEA= .27; CFI=.94; SRMR=.02), and college students (test-retest reliability: cognitive attitude=.83, affective attitude= .82; Cronbach's alpha: cognitive attitude= .84, affective attitude= .89; construct validity: $\chi^2 = 17.41$, $df = 8$, $p = .03$; RMSEA= .16; CFI=.95; SRMR=.04).

## Data Collection

The middle and high school students' data were collected in PE class with the assistance of their PE teachers. They first completed the questionnaire and then took the height and weight measurement at either of the three stations set up at three corners of their gym. The college students' data were collected at the beginning of their general PE class, which is compulsory in universities of China, with the assistance of their instructors. Students' questions were addressed immediately during the data collection.

### Data Reduction

*Cognitive attitude status.* Based on students' cognitive attitude scores, their cognitive attitude status was categorized into three categories—positive (score>4), neutral (score=4), and negative (score<4).

*Affective attitude status.* Based on students' affective attitude scores, their affective attitude was categorized into three categories—positive (score>4), neutral (score=4), and negative (score<4).

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

*Body weight status*. Students' body weight status was categorized into two categories—overweight and normal-weight—based on their BMI scores and the overweight cutoff score for Chinese adolescents and adults specified in Chen's (2008) review article.

### Data Analysis

Seven confirmative factor analyses (CFA) were first conducted to establish the baseline model of the cognitive and affective attitude scales for each group (three school levels groups, two gender groups, and two body weight status groups). Next, three sets of measurement invariance analyses were conducted for school level (three groups: middle school, high school, and college), gender (two groups: male and female), and body weight status (two groups: normal weight and overweight), respectively. Hu and Bentler's (1999) fit indices cutoff criteria were used to determine the model fit (chi-square, Standardized Root Mean-square Residual [SRMR] < = .09, Tucker Lewis Index [TLI] > = .95, and Comparative Fit Index [CFI] > = .95). For model comparison, ΔCFI was used to determine the level of measurement invariance across groups (ΔCFI <.01, Cheung & Rensvold, 2002). All these analyses were conducted using IBM SPSS Amos 22.0.0.

To address the first set of the research questions, gender and body weight status contingency tables were calculated for cognitive and affective attitude status for each school level and chi-square tests were conducted for gender and body weight status for each school level. To address the second set of the research questions, gender and body weight status contingency tables were calculated for cognitive-affective attitudinal structures for each school level and chi-square tests were conducted for gender and body weight status for each school level. 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 measure invariance analyses results for school level, gender, and body weight status. These results suggest that all four levels of measurement invariance (configural, metric, scalar, and residual variance) were achieved except for the residual invariance for school level. As suggested by Putnick and Bornsteint (2016), residuals are not part of the latent factors and do not influence the group means comparison. Thus, the measurement invariance results indicate that it is valid to compare the means of cognitive and affective attitude across the school level, gender, and body weight status groups.

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

| Group | *Chi-square* | *CFI* | *SRMR* | *TLI* | Factor loadings | *Cronbach α* | |
|---|---|---|---|---|---|---|---|
| | | | | | | Cognitive | Affective |
| Middle school | $\chi^2 = 91.865$, $df = 8$, $p < .01$ | .988 | .018 | .978 | .84-.95 | .93 | .94 |
| High school | $\chi^2 = 43.546$, $df = 8$, $p < .01$ | .995 | .012 | .991 | .86-.96 | .97 | .93 |
| College | $\chi^2 = 77.175$, $df = 8$, $p < .01$ | .993 | .022 | .987 | .82-.92 | .91 | .91 |
| Male | $\chi^2 = 79.045$, $df = 8$, $p < .01$ | .994 | .018 | .989 | .85-.94 | .92 | .93 |
| Female | $\chi^2 = 90.314$, $df = 8$, $p < .01$ | .992 | .020 | .985 | .87-.95 | .93 | .93 |
| Normal weight | $\chi^2 = 144.487$, $df = 8$, $p < .01$ | .992 | .019 | .986 | .86-.94 | .93 | .93 |
| Overweight | $\chi^2 = 23.976$, $df = 8$, $p < .01$ | .996 | .018 | .992 | .82-.94 | .90 | .93 |

**Table 2. Measurement Invariance Test Results for School Level, Gender, and Body Weight Status**

| | *Model* | $\chi^2/df$ | *CFI* | *SRMR* | *TLI* | *Model Comparison* | Δ*CFI* |
|---|---|---|---|---|---|---|---|
| School Level (middle school, high school, college) | A. Configural, no constraints | 212.586/24 | .992 | .018 | .985 | -- | -- |
| | B. Metric, loadings | 267.214/32 | .990 | .019 | .986 | A vs. B | .002 |
| | C. Scalar, intercepts | 385.351/40 | .986 | .020 | .984 | B vs. C | .004 |
| | D. Residuals, variance | 1161.863/52 | .954 | .027 | .960 | C vs. D | .032 |
| Gender (male, female) | A. Configural, no constraints | 169.360/16 | .993 | .018 | .987 | -- | -- |
| | B. Metric, loadings | 172.371/20 | .993 | .018 | .990 | B vs. A | .000 |
| | C. Scalar, intercepts | 182.654/24 | .993 | .018 | .991 | C vs. B | .000 |
| | D. Residuals, variance | 202.269/30 | .992 | .018 | .992 | D vs. C | .001 |
| Body Weight Status (normal weight, overweight) | A. Configural, no constraints | 168.463/16 | .993 | .019 | .987 | -- | -- |
| | B. Metric, loadings | 173.409/20 | .993 | .020 | .989 | B vs. A | .000 |
| | C. Scalar, intercepts | 176.213/25 | .993 | .020 | .992 | C vs. B | .000 |
| | D. Residuals, variance | 241.098/31 | .990 | .020 | .991 | D vs. C | .003 |

**Cognitive and Affective Attitude Status by School Level**

Table 3 shows the contingency table of cognitive and affective attitude status by school level. It showed that most students were holding positive cognitive attitude (94.8% students) and positive affective attitude (85.1% students) toward doing MVPA during leisure time. The Chi-square tests showed that there were significant differences for the distribution of students who were holding positive, neutral, or negative cognitive attitude ($\chi^2 = 56.03$, $df = 4$, $p < .01$) and affective attitude ($\chi^2 = 119.51$, $df = 4$, $p < .01$) for different school levels. Specifically, there was relatively lower percentage of high school students (91.3%) who were holding positive cognitive attitude than middle school (95.0%) and college students (94.8%). More high school students (7.4%) were holding neutral cognitive attitude than middle school (3.3%) and college students (2.0%). For affective attitude, it seemed that fewer college students (80.4%) were holding positive affective attitude than middle (90.0%) and high school (89.7%) students, and more college students (14.9%) were holding negative affective attitude than middle (5.3%) and high school (4.3%) students.

**Table 3. The contingency table of cognitive and affective attitude status by school level**

| | Negative Cognitive | Neutral Cognitive | Positive Cognitive | Total |
|---|---|---|---|---|
| Middle School | 1.7% (18) | 3.3% (35) | 95.0% (1012) | 100% (1065) |
| High School | 1.3% (10) | 7.4% (58) | 91.3% (716) | 100% (784) |
| College | 1.7% (36) | 2.0% (42) | 96.3% (2022) | 100% (2100) |
| Total | 1.6% (63) | 3.6% (142) | 94.8% (3744) | 100% (3949) |
| | Negative Affective | Neutral Affective | Positive Affective | Total |
| Middle School | 5.3% (57) | 4.7% (50) | 90.0% (958) | 100% (1065) |
| High School | 4.3% (34) | 6.0% (47) | 89.7% (703) | 100% (784) |
| College | 14.9% (313) | 4.7% (99) | 80.4% (1688) | 100% (2100) |
| Total | 9.9% (391) | 5.0% (197) | 85.1% (3361) | 100% (3949) |

**Cognitive and Affective Attitude Status by Body Weight Status**

Table 4 shows the percentage of normal-weight and overweight students by school level. It showed that about 20% students in each school level were overweight and 80% had normal weight. Table 5 shows the contingency table of cognitive and affective attitude status by body weight status for each school level. The Chi-square tests showed that there were no significant differences for the distribution of students in cognitive attitude status by body weight status for middle school ($\chi^2 = 2.70$, $df = 2$, $p = .26$), high school ($\chi^2 = 1.00$, $df = 2$, $p = .61$), and college students ($\chi^2 = .57$, $df = 2$, $p = .75$). For affective attitude status, there were no significant differences by body weight status either for middle school ($\chi^2 = .40$, $df = 2$, $p = .82$), high school ($\chi^2 = .02$, $df = 2$, $p = .99$), and college students ($\chi^2 = 1.65$, $df = 2$, $p = .44$). All these results suggested that the percentages of students who were holding positive, neutral, or negative cognitive and affective attitude were similar for normal-weight and overweight students in all three school levels.

**Table 4. Body weight status by school level**

| | Middle School | High School | College | Total |
|---|---|---|---|---|
| Normal-weight | 79.4% (846) | 82.9% (650) | 79.7% (1674) | 80.3% (3171) |
| Overweight | 20.6% (219) | 17.1% (134) | 20.3% (426) | 19.7% (778) |
| Total | 100% (1065) | 100% (784) | 100% (2100) | 100% (3949) |

**Table 5. The contingency table of cognitive and affective attitude status by body weight status for each school level**

| **Middle school:** | Negative Cognitive | Neutral Cognitive | Positive Cognitive | Total |
|---|---|---|---|---|
| Normal-weight | 1.8% (15) | 3.3% (28) | 94.9% (803) | 100% (846) |
| Overweight | 0.5% (1) | 2.3% (5) | 97.2% (213) | 100% (219) |
| Total | 1.5% (16) | 3.1% (33) | 95.4% (1016) | 100% (1065) |
| | Negative Affective | Neutral Affective | Positive Affective | Total |
| Normal-weight | 4.8% (41) | 4.7% (40) | 90.5% (765) | 100% (846) |
| Overweight | 5.1% (11) | 3.7% (8) | 91.2% (200) | 100% (219) |
| Total | 4.8% (51) | 4.5% (48) | 90.7% (966) | 100% (1065) |
| **High School:** | Negative Cognitive | Neutral Cognitive | Positive Cognitive | Total |
| Normal-weight | 1.7% (11) | 6.3% (41) | 92.0% (598) | 100% (650) |
| Overweight | 0.7% (1) | 5.1% (7) | 94.2% (126) | 100% (134) |
| Total | 1.5% (12) | 6.1% (48) | 92.4% (724) | 100% (784) |
| | Negative Affective | Neutral Affective | Positive Affective | Total |
| Normal-weight | 4.9% (32) | 5.1% (33) | 90.0% (585) | 100% (650) |
| Overweight | 5.1% (7) | 5.1% (7) | 89.8% (120) | 100% (134) |
| Total | 4.9% (38) | 5.1% (40) | 90.0% (706) | 100% (784) |
| **College:** | Negative Cognitive | Neutral Cognitive | Positive Cognitive | Total |
| Normal-weight | 1.8% (30) | 1.8% (30) | 96.4% (1614) | 100% (1674) |
| Overweight | 1.7% (7) | 2.4% (10) | 96.0% (409) | 100% (426) |
| Total | 1.7% (36) | 1.9% (40) | 96.3% (2024) | 100% (2100) |
| | Negative Affective | Neutral Affective | Positive Affective | Total |
| Normal-weight | 15.0% (251) | 4.5% (75) | 80.5% (1348) | 100% (1674) |
| Overweight | 14.3% (60) | 6.0% (26) | 79.8% (340) | 100% (426) |
| Total | 14.9% (313) | 4.8% (101) | 80.3% (1686) | 100% (2100) |

**Cognitive and Affective Attitude Status by Gender**

Table 6 shows the contingency table of cognitive and affective attitude status by gender for each school level. The Chi-square tests showed that there were no significant differences for the distribution of students in cognitive attitude status by gender for middle school ($\chi^2 = 1.24$, $df = 2$, $p = .54$), high school ($\chi^2 = 2.51$, $df = 2$, $p = .29$), and college students ($\chi^2 = 2.24$, $df = 2$, $p = .33$). These results suggested that the percentages of students who were holding positive,

neutral, or negative cognitive attitude were similar for male and female students in all three school levels.

For affective attitude status, there were no significant differences by gender for high school ($\chi^2 = 3.34$, $df = 2$, $p = .19$). But there were significant differences by gender for middle school ($\chi^2 = 7.26$, $df = 2$, $p = .03$) and college students ($\chi^2 = 29.14$, $df = 2$, $p < .01$). These results suggested that the percentages of students who were holding positive, neutral, or negative affective attitude were similar for high school male and female students. Fewer female students were holding positive affective attitude than male students in middle school and college (middle school: female= 87.5%, male= 92.3%; college: female= 75.4%, male= 84.2%). Correspondingly, more female students were holding negative affective attitude than male students in middle school and college (middle school: female= 6.4%, male= 4.1%; college: female= 19.5%, male= 11.2%).

**Table 6. The contingency table of cognitive and affective attitude status by gender for each school level**

| **Middle school:** | Negative Cognitive | Neutral Cognitive | Positive Cognitive | Total |
|---|---|---|---|---|
| Male | 1.3% (7) | 3.1% (18) | 95.6% (546) | 100% (571) |
| Female | 2.1% (10) | 3.6% (18) | 94.3% (466) | 100% (494) |
| Total | 1.7% (18) | 3.3% (35) | 95.0% (1012) | 100% (1065) |
| | Negative Affective | Neutral Affective | Positive Affective | Total |
| Male | 4.1% (23) | 3.6% (21) | 92.3% (527) | 100% (571) |
| Female | 6.4% (32) | 6.1% (30) | 87.5% (432) | 100% (494) |
| Total | 5.2% (55) | 4.7% (50) | 90.1% (960) | 100% (1065) |
| **High School:** | Negative Cognitive | Neutral Cognitive | Positive Cognitive | Total |
| Male | 0.8% (3) | 6.7% (25) | 92.6% (344) | 100% (372) |
| Female | 2.1% (9) | 6.3% (26) | 91.6% (377) | 100% (412) |
| Total | 1.4% (11) | 6.5% (51) | 92.1% (722) | 100% (784) |
| | Negative Affective | Neutral Affective | Positive Affective | Total |
| Male | 3.3% (12) | 5.4% (20) | 91.3% (340) | 100% (372) |
| Female | 6.0% (25) | 5.6% (23) | 88.4% (364) | 100% (412) |
| Total | 4.8% (38) | 5.5% (43) | 89.7% (703) | 100% (784) |
| **College:** | Negative Cognitive | Neutral Cognitive | Positive Cognitive | Total |
| Male | 1.7% (20) | 1.6% (19) | 96.7% (1148) | 100% (1187) |
| Female | 1.8% (16) | 2.5% (23) | 95.7% (874) | 100% (913) |
| Total | 1.7% (36) | 2.0% (42) | 96.3% (2017) | 100% (2100) |
| | Negative Affective | Neutral Affective | Positive Affective | Total |
| Male | 11.2% (133) | 4.6% (55) | 84.2% (999) | 100% (1187) |
| Female | 19.5% (179) | 5.0% (46) | 75.4% (688) | 100% (913) |
| Total | 14.8% (311) | 4.8% (101) | 80.4% (1688) | 100% (2100) |

**Cognitive-Affective Attitudinal Structures by School Level**

Table 7 shows the contingency table of cognitive-affective attitudinal structures by school level. It showed that most students were holding the *Positive cognitive-Positive affective structure* in middle school (89.6%), high school (88.1%), and college (80.0%). *Positive cognitive-Negative affective structure* was the second largest structure for middle school (3.7%) and college students (12.6%) and third largest structure for high school students (2.4%). *Neutral cognitive—Neutral affective structure* was the second largest structure for high school students (5.1%) and the third largest structure for middle school students (2.8%). The third largest structure for college students (3.7%) was *Positive cognitive—Neutral affective structure*.

The Chi-square test showed that there were significant differences for the distribution of students who were holding each of the cognitive-affective attitudinal structures ($\chi^2 = 240.07$, $df = 16$, $p < .01$). Based on the data in Table 7, it seems that significantly more college students were holding *Positive cognitive-Negative affective structure* (college= 12.6%, middle school=3.7%, high school= 2.4%) and *Positive cognitive—Neutral affective structure* (college= 3.7%, middle school=1.8%, high school= 0.9%) than middle and high school students. Fewer college students were holding *Positive cognitive-Positive affective structure* (college= 80.0%, middle school=89.6%, high school= 88.1%) and *Neutral cognitive—Neutral affective structure* (college= 0.8%, middle school= 2.8%, high school= 5.1%) than middle and high school students.

**Table 7. The contingency table of cognitive-affective attitudinal structures by school level**

| | Middle School | High School | College | Total |
|---|---|---|---|---|
| 1 Positive cognitive—Positive affective structure | 89.6% (954) | 88.1% (691) | 80.0% (1680) | 84.4% (3333) |
| 2 Positive cognitive—Neutral affective structure | 1.8% (19) | 0.9% (7) | 3.7% (77) | 2.6% (103) |
| 3 Positive cognitive—Negative affective structure | 3.7% (39) | 2.4% (19) | 12.6% (265) | 7.9% (312) |
| 4 Neutral cognitive—Positive affective structure | 0.2% (2) | 1.5% (12) | 0.3% (6) | 0.5% (20) |
| 5 Neutral cognitive—Neutral affective structure | 2.8% (30) | 5.1% (40) | 0.8% (16) | 2.3% (91) |
| 6 Neutral cognitive—Negative affective structure | 0.4% (4) | 0.8% (6) | 0.9% (19) | 0.7% (28) |
| 7 Negative cognitive—Positive affective structure | 0.3% (3) | 0.1% (1) | 0.1% (2) | 0.1% (4) |
| 8 Negative cognitive—Neutral affective structure | 0.2% (2) | 0% (0) | 0.3% (6) | 0.2% (8) |
| 9 Negative cognitive—Negative affective structure | 1.2% (13) | 1.2% (9) | 1.4% (29) | 1.3% (51) |
| Total | 100% (1065) | 100% (784) | 100% (2100) | 100% (3949) |

**Cognitive-Affective Attitudinal Structures by Body Weight Status**

Table 8 show the contingency table of cognitive-affective attitudinal structures by body weight status for middle school, high school, and college, respectively. The Chi-square tests showed that there were no significant differences for the distribution of students in the nine cognitive-affective attitudinal structures by body weight status for middle school ($\chi^2 = 5.15$, $df =$

8, $p$= .74) and college students ($\chi^2$ = 4.37, $df$ = 8, $p$= .82). There were significant differences for high school students ($\chi^2$ = 23.06, $df$ = 7, $p$= .002). More overweight students tended to be holding *Positive cognitive—Negative affective structure, Positive cognitive—Neutral affective structure,* and *Neutral cognitive—Positive affective structure* than normal-weight students. Fewer overweight students were holding *Positive cognitive—Positive affective structure* and *Neutral cognitive—Neutral affective structure* than normal-weight students.

**Cognitive-Affective Attitudinal Structures by Gender**

Table 9 show the contingency table of cognitive-affective attitudinal structures by gender for middle school, high school, and college, respectively. The Chi-square tests showed that there were no significant differences for the distribution of students in the nine cognitive-affective attitudinal structures by gender for middle school ($\chi^2$ = 13.65, $df$ = 8, $p$= .09) and high school students ($\chi^2$ = 7.78, $df$ = 7, $p$= .35). There were significant differences for college students ($\chi^2$ = 34.52, $df$ = 8, $p$< .01). Specifically, more female students (16.4%) were holding *Positive cognitive—Negative affective structure* than male students (9.6%). Fewer female students (75.2%) were holding *Positive cognitive—Positive affective structure* than male students (83.7%).

## Discussion

The purpose of this study was to understand Chinese middle school, high school, and college students' cognitive attitude, affective attitude, and cognitive-affective attitudinal structures toward doing MVPA during leisure time from a person-centered perspective. The proportions of students who were holding different attitude statuses and structures were explored and the influences of gender and body weight status on the proportions were determined.

**Students' Cognitive and Affective Attitude Status**

In general, most students were holding positive cognitive (94.8%) and positive affective attitude (85.1%) toward doing MVPA. Few students were holding negative cognitive attitude (1.6%) and negative affective attitude (9.9%). These findings are consistent with Rhodes and Courneya's (2005) findings on a sample of undergraduate students from Canada. They found that 92% of students were holding positive cognitive attitude toward exercising regularly, 2% holding negative cognitive attitude, 64% holding positive affective attitude, and 14% holding negative affective attitude. It is also consistent with the findings of studies using variable-centered approach which showed that on average students were holding positive cognitive/affective attitude for PA (e.g., Kamtsios, 2010; Wang & Hollett, 2021). The findings of this study suggest that most students tend to believe that doing PA is useful or enjoyable. Few students think that doing PA is useless or unenjoyable.

Table 8. The contingency table of cognitive-affective attitudinal structures by body weight status for middle school students

| | Middle School | | | High School | | | College | | |
|---|---|---|---|---|---|---|---|---|---|
| | Normal-weight | Over-weight | Total | Normal-weight | Over-weight | Total | Normal-weight | Over-weight | Total |
| 1 Positive cognitive—Positive affective structure | 90.0% (761) | 91.2% (200) | 90.2% (961) | 89.1% (579) | 86.1% (115) | 88.6% (695) | 80.2% (1343) | 79.3% (338) | 80.0% (1680) |
| 2 Positive cognitive—Neutral affective structure | 1.8% (15) | 1.4% (3) | 1.7% (18) | 0.6% (4) | 2.9% (4) | 1.0% (8) | 3.6% (60) | 4.3% (18) | 3.7% (78) |
| 3 Positive cognitive—Negative affective structure | 3.1% (26) | 4.6% (10) | 3.4% (36) | 2.3% (15) | 5.1% (7) | 2.8% (22) | 12.7% (212) | 12.4% (53) | 12.6% (265) |
| 4 Neutral cognitive—Positive affective structure | 0.2% (2) | 0% (0) | 0.2% (2) | 0.9% (6) | 2.9% (4) | 1.3% (10) | 0.2% (3) | 0.5% (2) | 0.2% (5) |
| 5 Neutral cognitive—Neutral affective structure | 2.6% (22) | 2.3% (5) | 2.6% (28) | 4.5% (29) | 2.2% (3) | 4.1% (32) | 0.7% (11) | 1.2% (5) | 0.8% (16) |
| 6 Neutral cognitive—Negative affective structure | 0.5% (4) | 0% (0) | 0.4% (4) | 0.9% (6) | 0% (0) | 0.8% (6) | 1.0% (16) | 0.7% (3) | 0.9% (19) |
| 7 Negative cognitive—Positive affective structure | 0.4% (3) | 0% (0) | 0.3% (3) | 0% (0) | 0.7% (1) | 0.1% (1) | 0.1% (2) | 0% (0) | 0.1% (2) |
| 8 Negative cognitive—Neutral affective structure | 0.2% (2) | 0% (0) | 0.2% (2) | 0% (0) | 0% (0) | 0% (0) | 0.2% (4) | 0.5% (2) | 0.3% (6) |
| 9 Negative cognitive—Negative affective structure | 1.2% (10) | 0.5% (1) | 1.0% (11) | 1.7% (11) | 0% (0) | 1.4% (11) | 1.4% (23) | 1.2% (5) | 1.4% (29) |
| Total | 100% (846) | 100% (219) | 100% (1065) | 100% (650) | 100% (134) | 100% (784) | 100% (1674) | 100% (426) | 100% (2100) |

Table 9. The contingency table of cognitive-affective attitudinal structures by gender for middle school students

| | Middle School | | | High School | | | College | | |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| 1 Positive cognitive—Positive affective structure | 91.8% (524) | 87.1% (430) | 89.6% (954) | 89.7% (334) | 87.2% (359) | 88.4% (693) | 83.7% (994) | 75.2% (687) | 80.0% (1680) |
| 2 Positive cognitive—Neutral affective structure | 1.0% (6) | 2.7% (13) | 1.8% (19) | 0.5% (2) | 1.4% (6) | 1.0% (8) | 3.4% (40) | 4.2% (38) | 3.7% (78) |
| 3 Positive cognitive—Negative affective structure | 2.8% (16) | 4.5% (22) | 3.6% (38) | 2.3% (9) | 3.0% (12) | 2.7% (21) | 9.6% (114) | 16.4% (149) | 12.6% (264) |
| 4 Neutral cognitive—Positive affective structure | 0.3% (2) | 0% (0) | 0.2% (2) | 1.3% (5) | 1.2% (5) | 1.2% (9) | 0.3% (4) | 0.2% (2) | 0.3% (6) |
| 5 Neutral cognitive—Neutral affective structure | 2.6% (15) | 3.0% (15) | 2.8% (30) | 4.9% (18) | 4.2% (17) | 4.5% (35) | 0.8% (9) | 0.8% (7) | 0.8% (16) |
| 6 Neutral cognitive—Negative affective structure | 0.2% (1) | 0.6% (3) | 0.4% (4) | 0.5% (2) | 0.9% (4) | 0.7% (5) | 0.5% (6) | 1.5% (14) | 1.0% (20) |
| 7 Negative cognitive—Positive affective structure | 0.2% (1) | 0.4% (2) | 0.3% (3) | 0.3% (1) | 0% (0) | 0.1% (1) | 0.2% (2) | 0% (0) | 0.1% (2) |
| 8 Negative cognitive—Neutral affective structure | 0% (0) | 0.4% (2) | 0.2% (2) | 0% (0) | 0% (0) | 0% (0) | 0.4% (5) | 0.1% (1) | 0.3% (6) |
| 9 Negative cognitive—Negative affective structure | 1.1% (6) | 1.3% (6) | 1.2% (13) | 0.5% (2) | 2.1% (9) | 1.3% (10) | 1.1% (13) | 1.6% (15) | 1.3% (28) |
| Total | 100% (571) | 100% (494) | 100% (1065) | 100% (372) | 100% (412) | 100% (784) | 100% (1187) | 100% (913) | 100% (2100) |

Another finding of this study was that comparing with the proportion of students holding negative cognitive attitude, more students were holding negative affective attitude, especially for college students (see Table 3). This trend is consistent with Rhodes and Courneya's (2005) findings mentioned above. The current study also found that the proportions of student holding negative cognitive attitude were very similar (around 1.5%) for middle school, high school, and college students, while the differences of the proportions of students holding negative affective attitude were salient between college students (14.9%) and middle/high school students (5.3%/4.3%). These findings imply that the affective attitude for PA tends to decline for many students when they move from high school to college. Longitudinal studies are needed to confirm this.

In recent decades, the benefits of doing PA have been widely recognized and promoted by many sectors of our society including the media, schools, hospitals, clinics, and many companies. The low proportions of students holding negative cognitive attitude may results from these promotions and advocations. The relatively higher proportions of students holding negative affective attitude is understandable, since the physiological burden (e.g., fatigue, muscle burn, hard breath) during exercise is not comfortable for many people. The salient differences of the proportions of students holding negative affective attitude between college students and middle/high school students may result from the differences of nature and purpose of the PA that they did. Most children and adolescents tend to do PA for fun or social interactions and their PA tends to be focusing on team sports or games (e.g., basketball, soccer; Corbin, 2002). College students and adults tend to do PA for health or body shape and their PA tends to be unstructured and focus on individual sport (e.g., running, bicycling; Hagger, 2018).

**Body Weight Status and Attitude Status**

It is intuitive to believe that body weight status may influence people's evaluations on doing PA. Some variable-centered studies also reported that the average scores of normal weight and overweight students' attitude for PA were different and normal weight students tended to have more positive attitude than overweight students (e.g., Deforche et al., 2006; De Bourdeaudhuij et al., 2005). The current study, however, found that there were no significant differences on the proportions of students who were holding negative, neutral, and positive cognitive and affective attitude toward MVPA between normal weight and overweight student groups in all three school levels. It suggests that the percentages of students who were holding positive, neutral, or negative cognitive and affective attitude were similar for normal-weight and overweight students in all three school levels. These results are inconsistent with the findings from the variable-centered studies. This inconsistency may result from the different approaches (person-centered VS variable-centered) used. It may be that on average there are differences on PA attitude between normal weight and overweight students. But individually, there are not significant differences on the proportions of students in each cognitive/affective attitude status between normal weight and overweight students. All studies that we know and involving the effects of body weight status on PA attitudes did not distinguish cognitive and affective attitudes. This could also be a reason of the inconsistent findings.

**Gender and Attitude Status**

Few studies investigated the gender differences on PA attitude. The existing findings tend to be mixed. Kamtsios (2010) found no significant gender differences, while Smoll and Schutz (1980) reported that boys had more positive attitudes than girls. These two studies

conceptualized the construct of attitude differently. Kamtsios (2010) did not distinguish cognitive and affective attitude and used a combined score to represent students' PA attitude. Smoll and Schulz (1980) were actually focusing on students' attitude toward different functions of PA (e.g., social interaction, health and fitness, aesthetic). The current study found that there were no gender differences on the proportions of students in different cognitive attitude status. It suggests that males and females tend to have similar percentage of students holding positive, neutral, and negative cognitive attitude toward PA. It also showed that the proportions of male and female students in different affective attitude status were similar for high school students and middle school students (although marginally significant, but differences were small). But there were significant gender differences on the proportions of students in different affective attitude status for college students. About 8% more female college students tended to hold negative affective attitude toward MVPA than male college students.

**The Cognitive-Affective Attitudinal Structures**

Based on the results on cognitive-affective attitudinal structures on MVPA, there are several salient trends emerged. First, the dominating cognitive-affective attitudinal structure for PA was *Positive cognitive—Positive affective structure*. About 84% students were holding this structure (80% for college students, 88% for high school students, and 90% for middle school students). This implies that most students think that doing PA is both beneficial and enjoyable.

Second, the ambivalent structure—*Positive cognitive—Negative affective structure*—was a salient structure comparing with other structures. About 8% students were holding this structure (12.6% for college students, 2.4% for high school students, and 3.7% for middle school students). These students tended to think that doing PA was beneficial but not enjoyable.

The third salient trend is that the number of students holding *Positive cognitive—Negative affective structure* might significantly increase (about 10%) when students move from high school to college and correspondingly the proportion of students holding *Positive cognitive—Positive affective structure* might significantly decrease (about 8%). These imply that more students started to think doing PA is beneficial but not enjoyable when they move from high school to college. This is corresponding to the above finding that more students started to hold negative affective attitude toward PA when they move from high school to college.

The fourth trend is that body weight status tends to have limited influences on the proportions of students holding each of the cognitive-affective attitudinal structures for all school levels. Although the Chi-square test was significant for high school students, the percentages of students holding each of these structures were similar for normal weight and overweight students.

The last salient trend is that gender tends to have no significant influences on the proportions of student holding each of these structures for middle and high school students. There was, however, significant influences for college students. More female college students (about 7% more) were holding *Positive cognitive—Negative affective structure* than male students. More male college students (about 8% more) were holding *Positive cognitive—Positive affective structure* than female students. These results imply that there tends to be more female college students than male college students who are holding this ambivalent attitudinal structure—*Positive cognitive—Negative affective structure*—for PA. More female college students than male students think that doing PA is beneficial but unenjoyable.

Although cognitive-affective attitudinal ambivalence has long been recognized as an important theoretical phenomenon in attitude research (Conner & Armitage, 2008; Thompson et

al., 1995), this study, to our knowledge, is the first study that examined students' cognitive-affective attitudinal structures toward doing PA. This study suggests that most students tend to be holding univalent/consistent cognitive-affective attitudinal structure. *Positive cognitive-Negative affective structure* tends to the most salient ambivalent structure, especially for college students. Further studies are needed to examine the effects of different attitudinal structures on PA behavior.

## Conclusions

This study was a descriptive study focusing on understanding middle school, high school, and college students' attitude status and cognitive-affective attitudinal structures toward doing MVPA using a person-centered approach. The following are the key conclusions:

(a) A majority of students (about 94%) tend to be holding positive cognitive attitude toward doing MVPA, which means that they think that doing MVPA is useful/beneficial/wise. Very few students (about 1.6%) tend to be holding negative cognitive attitude, which means that they think that doing MVPA is useless/harmful/foolish.

(b) Most students (about 85%) tend to be holding positive affective attitude toward doing MVPA, which means that they think that doing MVPA is enjoyable. A few college students (about 15%) tend to be holding negative affective attitude, which means that they think that doing MVPA is unenjoyable.

(c) There tends to have a significant increase on the number of students holding negative affective attitude toward MVPA when comparing students in high school (about 4%) and college (about 15%).

(d) Most students (about 84%) tend to be holding the *Positive cognitive—Positive affective* attitudinal structure toward MVPA, which means that they think that doing MVPA is both useful and enjoyable. The second dominating structure tends to be *Positive cognitive—Negative affective structure*. About 8% students were holding *this* structure, which means that they think that doing MVPA is useful but unenjoyable.

(e) There tends to have a significant increase on the number of students holding *Positive cognitive—Negative affective structure* toward MVPA when comparing students in high school (about 2.5%) and college (about 12.5%).

(e) Normal weight and overweight students tend to have similar proportions of students who are holding different cognitive attitude status, affective attitude status, and cognitive-affective attitudinal structures.

(f) Male and female tend to have similar proportions of students who are holding different cognitive attitude status, affective attitude status, and cognitive-affective attitudinal structures for middle and high school students. For college students, more female students tend to be holding negative affective attitude and *Positive cognitive—Negative affective structure* than male students.

This study furthers our understandings on students' attitude and attitudinal structures toward PA from a new perspective. The findings are inspirational for physical educators and PA promotors since most students tend to hold positive cognitive and affective attitude toward PA. But, the current study also reminds us that there may still be about 15% students who were holding negative or neutral affective attitude toward doing PA. Physical educators who want to promote students' PA behavior through changing their PA attitude should pay more attention on

students' affective attitude. Students' affective experiences should be carefully considered when designing PE curriculum or PA promotion programs.

In addition, this study also highlights the attitude-behavior gap. This study showed that most students were holding positive attitude toward MVPA. But, Fan et al. (2019) reported that only about 17.8% youth in Shanghai met the MVPA recommendations. It seems that positive PA attitude may not be able to directly translate into PA behavior. This attitude-behavior gap is understandable since many studies have suggested that PA is a complex health behavior and is influenced by many factors. To fully understand the attitude-behavior gap, studies examining the PA behavior differences between students with different cognitive/affective attitude statuses and attitudinal structures are needed.

It is important to note that this study is conducted in Shanghai, China. Cautiousness is needed when generalizing the findings to other populations. This study only focused on describing the status quo of students' affective and cognitive attitude status and structures toward MVPA. Studies integrating other related variables (e.g., self-efficacy, perceived behavior control, PA intention, behavior, habit) can shed new insights on how students' attitudinal status and structures functions with other variables to influence PA behavior.

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