Gender, BMI, values, and learning in physical education: A study on Chinese middle schoolers

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Abstract:

Students' different perceptions of task values influence their learning experience and achievement in physical education. Framed using the subjective task value construct, this study was conducted to determine the extent to which male and female Chinese middle schoolers with different body sizes differed in their perception of the task values. A second goal of the study was to identify the extent to which the task values along with gender and body size predicted students' performance on knowledge and physical skill tests. Data from a random sample of students ($N = 860$) from eight Chinese middle schools revealed that the boys appreciated intrinsic ($p = .001$) and utility values ($p = 02$); both boys and girls, however, equally appreciated the attainment value ($p = .73$). The boys performed better in physical skill tests than the girls ($p = .001$), whereas the girls scored higher in knowledge tests than the boys ($p = .04$). Regression analyses revealed that gender is the only predictor for performance on both knowledge and skill tests. Utility value and body size were predictors for skill, not for knowledge. These findings indicate that Chinese middle school boys and girls differed in valuing and achieving in physical education. The findings imply that Chinese boys need to strengthen cognitive learning and girls need to strengthen psychomotor skill development in physical education.

Keywords: Coeducation | Chinese middle schools | Pedagogy | Motivation

Article:

1. Introduction

Physical education has undergone a substantial transformation during the last 20 years (National Association of Sport and Physical Education [NASPE] & American Heart Association [AHA], 2006). Today, it serves the mission of schooling by helping children learn knowledge about the body, mechanisms of body movement, and the relationship between body movement and its health benefits. Learning in physical education transcends educational values in its tangible movement tasks. Consistent with those identified in other content areas, these values can be

conceptualized in the expectancy–value framework: attainment value, intrinsic value, and utility value (Chen et al., 2008, Eccles et al., 1984). However, endorsing the values in the process of learning is apparently influenced by personal and contextual factors in the gymnasium (Ennis et al., 1999). In the context of physical education, gender (Solmon, Lee, Belcher, Harrison, & Wells, 2003) and body size (Rich & Evans, 2005) have emerged as the two most controversial personal factors that influence the learning experiences.

Gender has been a central topic in the research literature in physical education (Harrison, Lee, & Belcher, 1999). Research studies have revealed quite significant differences between girls and boys in attitudes (Alley & Hicks, 2005) and content preference (Solmon et al., 2003). Some provide strong evidence suggesting possible social and pedagogical reasons leading to the differences (e.g., Brown & Evans, 2004). These findings are significant in that they challenge physical educators to re-consider curriculum designs and instructional strategies normally taken for granted in physical education.

With the growing outcry for physical education as part of the solution to the child obesity problem, body size has emerged as another important factor that demands physical educators to plan meaningful learning experiences for children with different body sizes (Azzarito & Katzew, 2010). The body-size factor compounds with the gender issue to impose unprecedented challenges for physical education to meet the unique needs of modern-day children for developing skillfulness and knowledge for healthful, active living. These two factors interactively or by themselves influence attitudes, motivation, learning behavior, and learning achievement in physical education (Solmon et al., 2003). The goal of this study was to identify differences displayed by middle school students in task values and performance in skill and knowledge assessments in terms of gender and body size characteristics.

1.1. Conceptualization of the gender issue

In physical education, gender is understood not as a biological concept, but a representation of social identity relevant to the content (Harrison et al., 1999). Solmon et al. (2003) articulated that male and female learners perceived physical activities with a gender lens. An important tenet of gender–content relation is that male and female students may have pre-determined gender label for physical activity and, in turn, the label may affect their participation in learning. Given the nature of physical activities and their social prevalence, males and females may demonstrate different participation patterns associated with their respective perception of gender-appropriateness of the activities. Using hockey as the target activity, Solmon et al. (2003) found that males tended to believe it was a male-only activity but females viewed it as gender-neutral. The data further showed that when females saw an activity as males they would be less likely to see themselves as competent in the activity.

Another salient tenet of gender issue in physical education is that despite perceived gender-appropriateness and perceived favoritism of content for males, female students refused to be sidelined in physical education (Azzaritto, Solmon, & Harrison, 2006). Qualitative data from the study suggested that parallel goals of having fun and learning in physical education kept both boys and girls from the influence of initial gendered-endorsement of activity choices. These goals allowed the teachers to believe physical education could be an equal-opportunity

environment where competitive activities were embraced by boys and girls. But even in this environment, Azzaritto et al. (2006) found that, girls were likely to be in a "subordinate" position in activities they perceived as for boys, such as basketball or flag football. To remain in active participation, girls have to "negotiate" to overcome the gender barriers in the learning space dominated by the masculine discourse. The gendered practices in the discourse of teaching and learning were also reported in other case studies (Azzarito & Katzew, 2010).

These studies appear to indicate that in physical education the socially constructed gender-appropriateness perception is likely to prevent girls from learning effectively in physical education or at least cost them extra effort to negotiate through a male dominated learning environment. These studies demonstrated that gendered curricular discourse is perpetuated and reproduced in physical education and limits the equal opportunity to learn. The findings have raised the issue of developing and maintaining a socially just learning experience for both girls and boys (Ennis et al., 1999).

This body of literature, based on case-study research evidence from the West, has demonstrated that girls are likely to be disfranchised in physical education due to the competitive nature of sport-centered content. Evidence from case after case suggests that girls can easily become disengaged. It may be reasoned that girls do not achieve as well as boys in learning, and are challenged emotionally because of gendered learning environment that favors boys (Oliver & Hamzeh, 2010).

1.2. The body size impact

Gender issue is often intertwined with the issue of body size as both may not be separate in influencing physical education experiences (Azzarito & Katzew, 2010) and reasons to exercise (Furnham, Badmin, & Sneade, 2002). Most recently, body image has been noticed in the literature as a factor contributing to learning disparity of girls in physical education. Girls and boys view moving bodies as in a "fluid" state that different sizes and shapes can become masculinity and/or femininity "signifiers" (Azzarito & Katzew, 2010, p. 34) that lead to gendered identities in physical education. Sykes (2010) reported that a fat body may be viewed differently by men and women and the image is disassociated with the concept dictated by the meaning of a healthy body.

With the growing concern about child obesity, body size is becoming a noticeable entity not only for researchers but also for teachers and children in physical education. On the one hand, some scholars (Kirk, 2006) declare that there is no such thing as child obesity; on the other hand, there are mountains of data from a variety of measures including the body mass index (BMI) suggesting otherwise (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). While physical educators need to consider possible implications of the contradiction for physical education programming, researchers (e.g., Azzarito and Katzew, 2010, Furnham et al., 2002, Oliver and Hamzeh, 2010) have begun to document the extent to which children may relate their own body image to the content. A common thread from these studies indicates that male students feel much more comfortable with physical education than their female counterparts and body size, actual or imagined, does little to males in comparison with female students. What is not clear is the relation of body size, coupled with gender, to actual learning outcome.

Extensive body image research has shown that people at all ages understand the concept of body image on a biological or anthropometric perspective, but interpret it on a psychological or sociological perspective. For example, in Patterson, Ellengerg, and Crossan (2003) children related silhouette projection body images to their own body shapes and sizes based on accurate and reliable BMI measures. But, the female children tended to yield a skewed interpretation of an "ideal" body image by overestimating their own body sizes. Ålgars et al. (2009) attributed the discrepancies between BMI measures and dissatisfaction of body image in Finnish adults, especially women, to the "sociocultural ideals of thinness" (p. 1127).

Research also found that children's and adults' body images are consistent with their actual BMI measures and this finding is consistent across different continents, from Asia (Pallan, Hiam, Duda, & Adab, 2011), to Europe (Ålgars et al., 2009, Cortese et al., 2010, Gualdi-Russo et al., 2007), and to North America (Park, 2011, Patterson et al., 2003). The consistency suggests that BMI serves as an important source of information for people across difference age and geographic locations to formulate their perceptions of own body sizes and images. An underlying indication is that BMI can be a valid and reliable measure to project various functions derived from self-perceptions of body image.

1.3. Perceived values of physical education

Gendered preferences for activities and body-size related perception of activity choices influence children's understanding of values that physical education can offer. Operationalized in tasks, values of physical education can be conceptualized similar to those found in subject matters taught in classrooms (Xiang, McBride, Guan, & Solmon, 2003). Namely, these are attainment value, intrinsic value, and utility value (Eccles et al., 1984). As part of the original components in Eccles' expectancy–value model for learner motivation, the value construct was used in studying gender-related differences between boys and girls in learning mathematics and science (Eccles et al., 1984). Tapping into this construct seems to be relevant for the purpose of the current study.

According to Eccles et al. (1984) the attainment value is conceptualized as perceived importance of mastering the content in the subject matter. The perceived importance is considered deriving from students' understanding of meaningfulness in the content relevance to life. The intrinsic value is perceived a pleasant feeling experienced in the learning process. Learning experiences sometimes can be dull or interesting. Because boys and girls may have different pre-determined, gendered preferences for content and learning processes, they may endure different feelings toward the learning process even though the learning tasks can be identical. The utility value refers to the usefulness of the content being learned in real life. Research has documented that students acknowledge the values in physical education (Xiang et al., 2003) and appreciate each value in terms of specific content taught at the moment (Chen et al., 2008).

These scholarly developments have reiterated the importance of clarifying the influence of gender and body size on learning experience and learning outcomes in physical education. To this purpose, the current study was designed to address the following specific research questions: (a) to what extent middle school boys and girls differed in their view of the task values and

learning outcomes in physical skills and knowledge and (b) to what extent gender, body size, and perceived task values collectively predicted learning outcomes in physical education. The inquiry into the influences of gender and body size on pre-adolescents' experience in physical education will further our understanding about the role of gender and body weight in motivating children to adopt a healthful living behavior. Although the literature has provided evidence on students' perception of engendered body sizes, experiences (Azzarito & Katzew, 2010), and barriers (Oliver & Hamzeh, 2010), it is necessary to gain additional insights about the extent of difference, if any, to which boys and girls value physical education and to which they achieve the learning goals. Such a study can inform us about possible consequences of gendered physical education experiences at the gender and gender/body size interactive levels. It will provide information about experienced task values of physical education as manifested in the gymnasium. Additionally, it may provide information for addressing the gendered learning at policy level; for example, to further enable us to consider if physical education should be offered in single-sex or co-educational format.

2. Method

2.1. Research setting and participants

The study was conducted in a very large metropolitan area in China where public schools had endured a massive physical education reform from a sport/play-based to a standard-based approach to curriculum (Wang, Ji, Huang, Liu, & Lin, 2008). Since the beginning of the 21st century, a curricular shift from sports to health enhancing concepts and exercises has begun in China's K-12 school physical education (Wang et al., 2008) to address the increasing rate of hypokinetic diseases (Ji, 2005, Reynolds et al., 2007). In 2007, Chinese Government issued executive recommendations that called for a school physical education reform by focusing on educating children with knowledge about health-enhancing physical activities. Physical education learning standards were developed, which are in close resemblance of those developed by NASPE of the U.S. (Wang et al., 2008). With the implementation of the reform underway, it has become imperative to learn if physical education experiences are valued by Chinese children and adolescents.

The participating middle schools ($n = 8$) were randomly selected from a centrally located urban school district ($n = 28$) and a suburban–semi-rural district ($n = 26$) representing the urban and suburban middle schools in the area in terms of teacher–student ratio, physical education instructional facilities, and course scheduling. Middle schools were targeted for this study because the students were at a time of transitioning from a relatively active younger age into a pre-adolescent age. According to Jacobs, Lanza, Osgood, Eccles, and Wigfield (2002), this is a time when children's task values about schooling start to decline. It is also a time when their physical activity participation begins to decline (Caspersen, Pereira, & Curran, 2000). Identifying interrelations among gender, body size/image, and task values in this age group will facilitate in determining functions of physical education. In addition, middle school students are able to distinguish the task values; thus provide valid data for the researchers to address the research questions with confidence.

Six of the eight schools had gymnasium. Average indoor and outdoor space for physical education was 4100 m^2 per school, ranging from 3000 m^2 to 7000 m^2. All schools had sufficient facilities and equipment for physical education. The smallest school had an enrollment of 300; the largest 2298. Average enrollment was 1199. All schools had three 45 minute physical education lessons per week. Physical education classes were taught by specialists who had at least a Bachelor of Education degree in physical education. The number of teachers per school ranged from three to nine. Average teaching load was 15 lessons per week. As part of their responsibility, the physical education teachers in each school rotated to lead the daily school-wide 20 minute calisthenics exercises. Each teacher was assigned several classes for which he/she was responsible for monitoring their self-organized after-school 90 minute mandatory physical activity (combination of free play and exercises). The teachers were also responsible for other school-wide health-related activities such as daily healthy-vision eye massage exercise and martial arts exercise (in two schools 15 and 25 min daily).

The sampling unit was physical education classes. One class from each of the 6th, 7th, and 8th grade was selected randomly from each school as data-providing class. A total of 24 intact classes and 870 students (mean age = 12.70) were included in the study (303 in 6th, M age = 11.82; 286 in 7th, M age = 12.62; and 281 in 8th grade, M age = 13.74). There were 439 boys (50.5%) and 421 girls (48.4%) in the sample (missing data: n = 10, 1.1%). All students received their parent permission to participate in the study and the study received Shanghai municipal government approval according to human subject protection regulations. In an assent form, the students were informed that responses they gave for the study would not be used for grading purposes and no one other than the researchers would have access to their responses. They were also informed that they could withdraw whenever they wanted to.

2.2. Variables and measures

2.2.1. Values of physical education content

Students' perceived content values in physical education were measured using the 13-item Self- and Task-Perception Questionnaire originally developed in mathematics (Eccles et al., 1984) and modified for physical education by Xiang et al. (2003). The questionnaire measures students' expectancy beliefs (5 items on perceived success in learning) and attainment value (2 items on importance in succeeding in learning), utility value (2 items on usefulness of the content), intrinsic value (2 items on the extent of enjoyment of learning experiences), and cost (2 open-ended items for written responses on potential motivation barriers to learning). Each item, except the cost items, was attached to a 5-point scale anchored by a descriptor appropriate for the item.

In both theoretical articulations and empirical operations, expectancies and task values are conceptualized as independent constructs supporting each other's motivational functions in achievement settings (Wigfield, Tonks, & Klauda, 2009). Cost is theorized (Eccles & Wigfield, 1995) to be a factor primarily associated with children's choice decisions and is a least studied component to date (Wigfield et al., 2009). No mature measures for cost have been developed. It can be speculated that the absence of empirical attention to cost might derive from the fact that children have few opportunities in school to make choice decisions that require them weighing in cost. For keeping the focus of the study, students' responses to expectancy beliefs items and cost

were not included in the analysis, although they were measured. The questionnaire was determined in many empirical studies (e.g., Chen et al., 2008, Eccles et al., 1984, Xiang et al., 2003) as being able to generate valid and reliable data in physical education.

For this study, the items were translated into Chinese and the translation was validated by bi-lingual Chinese and American scholars (n = 6) using an Adelphi procedure. A 100% agreement on the consistence between the English and Chinese versions was achieved (Chen & Liu, 2008). The Self- and Task-Perception Questionnaire has been translated in many languages and demonstrated to be one with cross-culture validity and reliability in many empirical studies. Bong's (2001) study in Korean middle and high school students has shown striking similarities in response patterns in comparison to Western students in Korean math, science, and language courses. Chen and Liu (2008) reported similar findings among Chinese college students. Wigfield et al. (2009) reviewed other research works in China and Germany and pointed out the striking similarities in findings, although they cautioned that there are too few studies in other cultures to reach a conclusion. Given the tremendous similarities in physical education content across the world and the information from the literature, we are confident that the instrument should be able to capture the meaning of task values the instrument was designed to capture. Table 1displays the task value items used in this study and the Cronbach's α reliability coefficients for each dimension based on the data from this study.

Table 1. Task value items and reliability coefficients by task value dimensions.

Attainment value items (α = .68)						
1. How important do you think PE is for you?						
Not very important	1	2	3	4	5	Very important
2. Compare to math, reading, and science, how important is it for you to learn in PE?						
Not very important	1	2	3	4	5	Very important
Utility value items (α = .77)						
3. Some things that you learn in school help you do things better outside of school. We call this being useful. For example, learning about plants at school might help you grow a garden at home. Can you tell me how useful you think things you learned in PE are?						
Not useful at all	1	2	3	4	5	Very useful
4. Compared to your other school subjects, how useful are the things learned in PE?						
Not useful at all	1	2	3	4	5	Very useful
Intrinsic value items (α = .82)						
5. In general, how fun do you think your PE classes are?						
Very boring	1	2	3	4	5	Very fun
6. How much do you like your PE classes?						
Don't like it at all	1	2	3	4	5	Like it very much

2.2.2. Skill performance

A badminton overhand clear skill test and a basketball control dribble test were used to assess motor skills. The skills the tests assess are important for life-long participation in physical activities. The arm striking movement skill that the badminton overhand clear skill assesses is fundamental to many physical activities such as baseball pitching/throwing, volleyball serve, and tennis overhand smash (Gallahue, 1996). The striking pattern in the test may also be transferred

to learning and playing many sports including tennis, racquetball, handball, and volleyball. Therefore, success in mastering the skill may have broad implications for future effective participation in physical activity. The test was designed by Lockhart and McPherson (1949) with a validated and standardized scoring system. The test–retest reliability coefficient was .90 and the concurrent validity coefficient ranged from .71 to .90 based on criterion measures of experts' ratings and round robin tournament (Lockhart & McPherson, 1949). During the test, the student is asked to continuously hit a shuttlecock against a wall from a restriction line 6 1/2 ft away from the wall. Each successful return of the shuttlecock against the wall was scored one point. The total score was the sum of the hits in three trials (See Lockhart & McPherson, 1949, for detailed description of this test).

To assess the skill to control whole body coordination, the AAHPERD basketball control dribble test (American Alliance for Health, P. E., Recreation and Dance [AAHPERD], 1984) was used. This test is important in that it emphasizes the skill to coordinate whole body movement, footwork, and object manipulation; all are important skills for life-long participation in sports and physical activity. The concurrent validity of the test has been reported to range from .37 to .91 for both genders and the reliability has been showed to range from .93 to .97 for females and from .88 to .95 for males. In the test, the student dribbled the ball around five cones in a zig-zag pattern in the regulation-size free-throw lane on a basketball court. The time required to complete the course legally was recorded as the score for a trial. The total test score was the sum of the time for two trials (see AAHPERD, 1984, for detailed description of the test).

2.2.3. Knowledge

The physical education curriculum mandated that students should learn cognitive knowledge about physical activity benefits and health-enhancing exercise principles. One important content change in the physical education curriculum reform in China has been re-focusing on teaching cognitive knowledge associated with the benefits and principles of exercising. Mastery of the knowledge has become a learning outcome to be assessed in physical education. Given the fact that China uses a centralized education system and relies on the national curriculum, the new focus of physical education has been implemented in schools nationwide, including the schools in this study.

In this study, the knowledge was assessed using a standardized knowledge test with questions developed as part of the curriculum. The questions in the tests were validated using question-by-question deliberations by a group of researchers in kinesiology sciences from a prestigious sport university in China ($n = 6$). The content deliberations were focused on the age/grade appropriateness of content and wording/vocabularies to be used in the test construction. The standard for inclusion of a question and answer keys was 100% agreement among the experts. The content validation process generated 24 questions for the 6th grade, 20 for the 7th grade, and 25 for the 8th grade. The difficulty and discrimination indexes were calculated to further generate validity evidence for each question using a known-group procedure (Morrow, Jackson, Disch, & Mood, 2005). During this process, groups of students who had received the instruction on physical activity benefits and exercise principles were given the experimental knowledge tests. Students whose total scores were in the top 27% were assigned in a “learned” group. Those whose total scores were in the bottom 27% were classified as “not-learned” group. The index of

difficulty and the index of discrimination were computed by contrasting the responses to each question by the two groups of students. The selection of questions was based on typically recommended standards (Morrow et al., 2005): questions with an *index of difficulty*between 40% and 60% were determined as "usable"; those between 45% and 55% as "must-use"; those out of these ranges were determined "un-usable." A 40% threshold was set for the *index of discrimination*. Those between 40% and 60% were classified as "usable"; above 60% as "must use"; those below 40% as "un-usable." The procedure generated various numbers of validated questions for the 6th, 7th, and 8th grades. The final test for each grade was constructed with 12 multiple-choice questions. A correct answer to a question was assigned a score of one; incorrect answer was zero. The maximum possible score a student might earn was 12. The total score represented the performance on the test and, consequently, represented how much a student mastered the content.

2.2.4. Gender and body size

Gender and age information was gathered along with knowledge tests and/or the expectancy–value questionnaire. Body size was measured using the body mass index (BMI) that was calculated using students' height and weight. Height and weight were measured by trained data collectors during physical education class using certified height and weight scales. All scales were calibrated to zero before use to ensure accurate measurements. The height was measured in centimeter and the weight was in kilogram. The standard formula, BMI = weight/height^2, was used to calculate the BMI index for each student. The students then were classified into Overweight/Obese, In Healthy Zone, and Thin categories using the following procedures. The gender–age adjusted Overweight standard (85% above the growth curves) (Ji, 2005) for Chinese children was used to determine those who were overweight. Because there is no published standards to distinguish In Healthy Zone and Thin categories, cutoffs were calculated according to the Chinese children growth curves (Li, Ji, Zhong, & Zhang, 2009) using the data from the study. Table 2 lists these cutoffs used in the study. The standards are slightly lower than those used in the U.S. due to the population-adjusted low baseline (Cheng, 2004). All categorization calculations were age/gender adjusted.

Table 2. BMI status classification standards used in the study.

Grade/mean age	Thin		In healthy zone		Overweight	
	Girls	Boys	Girls	Boys	Girls	Boys
6th/11.82	< 15.40	< 15.60	15.40–21.10	15.60–20.30	> 21.10	> 20.30
7th/12.62	< 16.40	< 16.60	16.40–21.90	16.60–21.00	> 21.90	> 21.00
8th/13.74	< 17.00	< 17.10	17.00–22.60	17.10–22.90	> 22.60	> 21.90

2.3. Data collection

A team of data collectors consisting of kinesiology graduate students (N = 16) were trained in four six-hour sessions on data collection protocols and initial data organization. The training took place in classrooms and gymnasiums. The purpose of training was to help the data collectors master the protocol and data collection techniques to minimize threats to data reliability. The data collection took place toward the end of the semester when the participating middle school students had experienced the standard-based curriculum. The height and weight were measured first. The measurement took place in a quiet location in the gymnasium or physical education

teacher office. Each student was measured individually. The results were recorded on site immediately after the measurements were taken. The expectancy–value questionnaire was administered afterwards. The data collector read aloud each item to the students in a quiet classroom and instructed them to respond honestly and independently. Skill tests were administered after the questionnaire with assistance from physical education teachers. The knowledge test was given in the final examination week as part of the over knowledge assessment, but the test score was not calculated into students' final grade. The data collector read each question to the students and collected all question and answer sheets after students completed the test. The entire data collection took about three weeks to complete.

2.4. Data reduction and analysis

Responses to the expectancy–value questionnaire were aggregated according to its original construct dimensions (Eccles et al., 1984). For the purpose of this study the dimension of expectancy beliefs and cost (in open written responses) were not included in the subsequent analysis. Skill test scores were summarized per test specification to form a total score for each skill. Responses to the knowledge tests were graded, and a correct percentage score (number of correct answer/total number of question) was calculated and used in the analysis. BMI measures were further categorized into Overweight, In Zone, and Thin using the standards discussed above. To answer the first research question, multivariate analysis of variance (MANOVA) was used to examine the extent to which the boys and girls differed in the skill test, knowledge test, and task value scores. To answer the second research question, a series of simultaneous multiple regression analyses were conducted to determine the extent to which gender and BMI predicted performances on skill and knowledge tests.

Table 3. Descriptive statistics by gender.

	Female (*n* = 421) M/SD	**Male (*n* = 439) M/SD**
Striking skill	4.64/6.18	6.75/6.69
Dribble skill	19.37/7.85	15.65/6.25
Knowledge	.41/.15	.38/.15
Attainment value	4.04/.85	4.05/.92
Utility value	3.82/.97	4.04/1.56
Intrinsic value	3.77/1.03	4.09/.97
BMI		
Overweight	31 (7.4%)	62 (14.10%)
In healthy zone	208 (49.40%)	210 (47.80%)
Thin	182 (43.20%)	167 (38.00%)

3. Results

Descriptive statistics of students' responses to the measures were reported in Table 3. Using a rubric developed to assess U.S. middle school students' performance based on a T-score distribution (Chen & Sun, 2006), 97% (n = 842) students were classified into “Unskilled” category, .20% (n = 2) into “Capable,” and only .10% (n = 1) into “Proficient” in the striking skill; and 75% (n = 651), 5.7% (n = 50), and 2.8% (n = 24) into these respective categories in the coordination skill. These outcome measures indicated that the students performed rather poorly on these tests. The data were skewed positively (toward low ends of the distribution). However,

the skewness was not severe (ranging from 1.6 to 2.1); both univariate and multivariate distributions were symmetrical; and group sample sizes were large and balanced. Thus, no alternative data transformation (e.g., trimming) was performed and the conventional statistical analyses were continued.

There were 421 (48.40%) girls and 439 (50.50%) boys. Using the BMI standards described above, 93 (10.81%) were overweight, 418 (48.60%) in the healthy zone, and 349 (40.59%) thin. Gender breakdown of the data can be found in Table 3. Results from a χ^2 test indicated that more boys were overweight and more girls were thin ($\chi^2 = 10.61$, $df = 2$, $p = .005$).

To answer the first research question, two MANOVA analyses were conducted to compare the extent to which the female and male students differed in the means of (a) the skill and knowledge test scores and (b) the task values. The MANOVA multivariate analysis revealed that the boys and girls differed on these measures (Hotelling's $T = .08$, $F_{(7, 757)} = 20.66$, $p = .001$, $\eta^2 = .08$). The analysis on the Between-Subjects effects, reported in Table 4, confirmed the observations in Table 3 that the boys performed better than the girls in both skill performance tests, while the girls scored higher than the boys in the knowledge test.

Table 4. Results of MANOVA on knowledge and skill test mean scores between boys and girls.

	Type III SS	***df***	***MS***	***F* value**	***p***	η^2	**Power[a]**
Badminton	755.57	1	755.57	18.12	.001	.02	.99
Basketball	2255.69	1	2255.69	45.50	.001	.06	1.00
Knowledge	.10	1	.10	4.26	.04	.01	.54

[a] Computed using α = .05.

The boys and girls also differed on the task value measures (Hotelling's $T = .03$, $F_{(7, 786)} = 8.85$, $p = .001$, $\eta^2 = .03$). As reported in Table 5, the results from the analysis on the Between-Subjects effects suggested that the boys and girls did not differ on the attainment value. But the boys rated the utility value and the intrinsic value higher than the girls did.

Table 5. Results of MANOVA on task value mean scores between boys and girls.

	Type III SS	***df***	***MS***	***F* value**	***p***	η^2	**Power[a]**
Attainment value	.90	1	.90	.12	.73	.00	.06
Utility value	9.01	1	9.01	5.54	.02	.02	.65
Intrinsic value	20.39	1	20.39	20.09	.001	.03	.99

[a] Computed using α = .05.

To answer the second research questions, three simultaneous regression analyses were conducted using task values, gender, and BMI as independent variables, gender–BMI interaction as the moderator, and learning outcomes as dependent variables. Binary correlation coefficients between the variables were reported in Table 6. In all three regression analyses, the gender–BMI interaction was not found to be predictive for knowledge ($\beta = -.019$, $t = -.360$, $p = .719$), striking skill ($\beta = -.043$, $t = -.852$, $p = .395$), or coordination ($\beta = -.032$, $t = -.345$, $p = .730$). For knowledge test, the results suggested that gender is a significant predictor ($\beta = -.083$, $p = .025$). However, this model only accounted for .7% of the variances in students' knowledge test scores. Gender ($\beta = .177$, $p = .000$) and utility value ($\beta = -.086$, $p = .045$) were found to be significant predictors for the striking skill performance. Approximately 3.3% of the

variance was accounted for in this model. For the coordination skill test, results indicated that gender and BMI were strong predictors ($\beta = -.235$, $p = .000$ for gender; $\beta = -.107$, $p = .003$ for BMI). The model accounted for 6.5% of the variances in the basketball test scores.

Table 6. Correlation coefficients between the variables (all/girls/boys).

	BMI	Basketball	Badminton	Knowledge	Attainment	Utility
Basketball	−.12**/−.09/−.13					
Badminton	.02/−.05/.04	−.28**/−.26**/−.24**				
Knowledge	.06/.04/.09	−.14**/−.12*/−.21**	.01/−.02/.06			
Attainment	−.03/−.03/−.05	−.01/.00/−.01	.06/−.07/.04	−.07/−.05/−.07		
Utility	−.03/−.06/−.02	−.03/.04/−.04	.09*/−.11*/.06	−.07/−.08/−.05	.47**/.59**/.41**	
Intrinsic	−.04/−.13*/.00	−.04/.02/−.05	.03/.01/−.01	−.05/−/03/−.04	.53**/.59**/.48**	.52**/.66**/.44**

** $p < .01$ level (2-tailed).
* $p < .05$ level (2-tailed).

4. Discussion

The results reveal that boys and girls in the East of the world did differ in valuing physical education and performances on learning outcome assessments. On the surface, as demonstrated in the descriptive data, the common values in physical education were recognized and probably highly regarded (~ 4.00 on the 5-point scale). But the in-depth MANOVA analyses demonstrated that the male students in Chinese middle schools placed higher utility and intrinsic value to physical education. The results indicate that the boys considered physical education more useful and enjoyed the experience better than the girls. Related to the case studies reviewed earlier (e.g., Ennis et al., 1999, Solmon et al., 2003), the results may be interpreted as evidence that current physical education programming in China in fact favors gendered discourses where the content might be more male-friendly. Because of this, girls' lower ratings on the values may indicate their reservations about the enjoyment and usefulness of the content.

On the other hand, the analyses revealed no difference in the attainment value between the boys and girls, suggesting that they equally valued the importance of physical education. For the boys, their attainment value may be in root with what Eccles and Wigfield (1995)elaborated as an understanding of experiential meaning. The content is important because it is useful and enjoyable for the boys. But for the girls studying in physical education is important because they can learn cognitive knowledge or balance off their weakness in physical skills for receiving a good grade. The importance for girls was manifested in girls' better performance on the knowledge test. However, the small effect size ($\eta^2 = .01$, Table 4) may suggest that the boys were not behind too much. They might take knowledge learning in physical education equally important as did the girls. Further studies are encouraged to further examine the difference. From an educational point of view, it is hoped that boys and girls value physical education equally and learn equally well.

The data also show that the boys and girls differed in skill and knowledge tests. The boys outperformed the girls in psychomotor skill tests with moderate effect size, while girls outperformed the boys in the cognitive knowledge test although the effect size is small. Although we do not have relevant data on their effort in learning, it can be reasoned that both boys and girls in modern Chinese public schools are working equally hard for gaining access to higher

education by actively seeking knowledge and developing skills in all academic areas (Li, 2003). In a study where Chinese college students recalled their motive to participate in physical education in their secondary schools, Chen and Liu (2008)reported that Chinese students were motivated because they wanted to maintain a good health to ensure a sound physical capacity to meet the mental/cognitive pressure of gaining access to higher education. Data from this study seem to further indicate that regardless of the different perception of other values, boys and girls as early as in the middle school have developed recognition that physical education is an important subject matter. Additional research is needed to further determine specific tenets based on which Chinese secondary school students consider physical education "important".

The differentiations observed in MANOVA were partially supported by the regression results. Although small, the βs of the regression models indicate a statistically significant differentiation power of gender in all three outcome measures. The small but significant explained variances (R^2) suggest a certainty of gender in explaining observed differences in these measures. The small explained variances and βs, however, may suggest that although Chinese middle school students recognized the values of physical education, they were not necessarily able to translate perceptions of the values into effective learning strategies to master motor skills and cognitive knowledge. Specifically, the results indicate that the students who declared recognition of high task values in physical education were not those who scored better in outcome assessments. The findings may further imply that conveying values to students and teaching the content may be treated as distinctively different endeavors in teaching physical education in China. It seems that Chinese middle school students are ready to formulate positive values about physical education for some reason, but may still have difficulty to transfer their understanding of the values into developing and mastering knowledge and skills. This finding echoes findings in the U.S. For example, Zhu and Chen (2010) reported that the connection between the task values and motor skill learning in U.S. middle school students was weak.

The results from the current study do not allow a full interpretation of the observed disconnection. But we do not consider it merely a student-centered problem. As early as 2001, Ennis (2001) noticed that physical education is a school subject in "high need" but of "low demand." Although education institutions, community leaders, and the public acknowledge the irreplaceable contribution of physical education to children's holistic development, they are reluctant to allocate relevant resources to support physical education as a viable academic area of study in K-12 schools. Does the disconnection found in this study as well as those in the U.S. suggest that students are receptive of this reality? Thus, is it likely that they perceive physical education as a subject matter high in value but low in substance?

The disconnection is comprehensive and may not relate to gender or body-size. Related to the reports documenting different learning experiences by boys and girls, this finding may point to a fact that the observed differences in gendered behavior or body-sized discourse in physical education may not be the outcome of physical education. They may be acquired outside of but displayed within physical education by students, as implied in responses to hockey by male and female college students in a previous study (Solmon et al., 2003).

What is not statistically significant may have significant meaning. BMI did not emerge as a viable factor associated with the students' values and skill/knowledge in physical education. The

finding suggest that at least in China body size issues have not surfaced to a level that might hinder learning in physical education. Nevertheless, the comparison of BMI between the boys and girls may send out an alarm, which warns our professional physical educators across the globe that more boys are becoming overweight than girls in China.

In summary, the findings show that the Chinese boys and girls differed in valuing and achieving in physical education. Boys perceived high utility and intrinsic values in physical education and excelled in motor skill related assessments. But girls valued attainment value as much as boys did and excelled in cognitive assessment in physical education. At the present time, BMI may not be a factor contributing to formulating values and achieving in physical education.

The findings are limited within the context in which the study was conducted. Although knowledge and skills were assessed in this study, the specific assessment items were not exactly those required by the physical education curriculum. When interpreting the data, the reader should be aware of the issue of authenticity of learning achievement and should not attribute the data as the sole learning outcome from physical education. Secondly, although the task values and expectancy beliefs are distinct theoretical constructs and each could be studied without the other (Wigfield & Eccles, 1992), many empirical studies have demonstrated correlation between the two constructs. Our exclusive focus on analyzing the task values should not be considered to be an examination of the expectancy–value theory. Instead, the findings should be understood within the realm of the value dimensions only. Thirdly, BMI is a controversial variable in terms of its validity for body fatness. Although we used racially relevant classification standards, the outcome might not be interpreted as a measure of body composition. The weight status was found to be a valid predictor for the coordination skill test scores. The results, however, should not be interpreted as though BMI would determine the performance.

4.1. Implication

The findings prompted the researchers to revisit the issue of co-educational physical education. The findings seem to suggest that Chinese boys and girls may value and achieve differently in physical education. However, the differences should not be understood with caution due to small effect sizes observed in the MANOVA results. The small effect sizes seem to suggest that although boys and girls may perceive the task values in different ways, the differences may not be determining factors for their learning achievement in physical education. Physical education is mostly taught in a co-educational environment, while occasionally is taught in single-sex classes. If the results of the study can be viewed as a needs assessment, they may suggest that Chinese boys need to strengthen cognitive learning in physical education and girls psychomotor skills. Striking a curricular balance in a co-educational context to emphasize the two content focuses simultaneously for boys and girls to learn can be difficult. Empirical studies are needed to explore this important issue to maximize the learning opportunities for both boys and girls.

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