An examination of the multidimensionality of situational interest in elementary school physical education

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Abstract:

It has been demonstrated that situational interest in physical activity may derive from five dimensional sources, Novelty, Optimal Challenge, Attention Demand, Exploration Intent, and Instant Enjoyment. The purpose of this study was to examine the multidimensional sources in elementary school physical education. The five dimensions were measured in 5,717 students in third, fourth, and fifth grades from a random sample of 30 elementary schools. Students' responses were randomly divided into two samples for a two-step confirmatory factor analysis. The results confirmed that the five dimensions are primary sources of situational interest for elementary school physical education. The findings implied that situational interest should be taken into account as a necessary curricular component in elementary physical education.

Keywords: motivation | learning environment

Article:

Situational interest has been identified as a powerful motivator for novice learners (Hidi, 2001; Alexander, 2006). The construct has been articulated to consist of multidimensional sources (Deci, 1992) that have been empirically tested in different content domains, including physical education. Research findings suggest that the structure of situational interest construct may vary because of its high sensitivity to the learning environment defined by the content, instructional strategies, and learners (Chen & Ennis, 2004; Hidi, 2001). To maximize its applicability to education, the function of situational interest dimensions needs to be examined carefully in the content domain to which it will be applied. The purpose of this study was to examine the situational interest construct and its dimensional sources in elementary school physical education by validating the dimensions previously identified in middle school physical education.

Conception of Interest

Interest plays a critical motivational role in human learning and development (Alexander & Murphy, 1994). Interest theorists assume that interest arises as an individual interacts with his/her environment (Krapp, Hidi, & Renninger, 1992; Wade, 2001) and can be conceptualized as individual predisposition and as a psychological state (Ainley, Hidi, & Bemdorff, 2002). In education, two types of interest, individual/personal and situational, have been studied extensively with regard to the relationship between interest and learning. In research, individual interest is considered to be an individual's predisposition characterized by high attention given to certain events and objects. Individual interest is activity-specific and associated with value and previous knowledge (Wade, 2001). In physical education, individual interest is associated with students' personal preferences of certain physical activities over others. For example, some students prefer basketball to track and field, others prefer tumbling to baseball. When the lesson content matches a student's individual interest, the student is likely to display high motivation to engage in it. Situational interest, on the other hand, is defined as a psychological state evoked by certain aspects of the immediate environment, such as the ways learning tasks are organized and presented (Ainley et al., 2002). In other words, events or activities in the environment that generate a momentary interest elicit situational interest (Wade, 2001). In physical education, for example, a student who may not have individual interest in an activity, such as floor hockey, can momentarily become interested in a hockey skill task or a modified game simply by the task design or the game set up.

Theoretical Framework of Interest

The above theoretical distinction of interest has been used as an overarching theoretical framework in educational research on interest-based motivation (Hidi & Baired, 1986). The framework has been empirically examined in K-12 reading, mathematics (Hidi & Anderson, 1992; Mitchell, 1993; Schraw, Flowerday, & Lehman, 2001), and physical education (Chen, Darst, & Pangrazi, 1999). It has also been examined in college classrooms (Alexander, Jetton, & Kulikowich, 1995). Findings from the research have shown that students with a high level of interest can demonstrate a high level of cognitive engagement, increased motivation to learn, and enhanced achievement (Pintrich, 2003). For example, Ainley et al. (2002) revealed that both individual and situational interest can result in increased motivation to learn a particular topic. Interests, the researchers suggested, influenced students' affective responses after reading a text and, in turn, further influenced the degree of persistence (an important motivation indicator) in the reading tasks. The increased motivation was associated with achievement outcome in reading tests.

The two components in the theoretical framework have been considered to have different utility values in education (Alexander, 2006; Hidi & Anderson, 1992). Hidi and Anderson convincingly argued that using students interests as a primary motivation tool could be difficult because of the diverse nature of interests among learners. Individual interest has been considered to evolve slowly along with the growth of knowledge, value, and positive emotion about the object or activity (Krapp et al., 1992). In her domain learning theory, Alexander (2006) warned educators that at the initial stage of learning, students may not have enough knowledge and values on which to develop individual interest. Further, the strong association between individual interest and knowledge and values makes it extremely difficult for teachers to change or redirect

students' interest in learning tasks that may not interest them in the first place (Hidi & Anderson, 1992).

Situational interest, on the other hand, is characterized by instantaneity. A highly, situationally interesting activity can immediately attract students' attention, involve them in the process, and provide instant, positive feelings about the activity (Hidi, & Harackiewicz, 2000). Given this spontaneity, situational interest is considered to be a motivator the teacher can control to a certain extent (Schraw et al., 2001). Deci's (1992) seven dimensional components (novelty, challenge, attention demand, sense of delight, exploration intention, desire arousal, and time alteration) were tested. Hence, situational interest can be a useful motivator in educational settings in which group-based instruction is the primary method used.

Situational Interest and Dimensional Sources

As a construct, situational interest is structurally more complex than individual interest, which depends on a person's existing knowledge and value about an activity. Situational interest has been articulated as multidimensional. Deci (1992) proposed that it encompasses person, activity, and social context dimensions. The Person dimension consists of experiential and dispositional components. In a situationally interesting environment, the individual will experience quality attention, a sense of delight, exploration intention, time alteration, and desire. A person evaluates enjoyment based on the attentional demand and sense of delight that occur when he/she engages in an activity. Exploration intention, time alternation, and desire represent the stimulation the activity generates. Deci (1992) assumed that these components were more likely to arouse a person's perception of situational interest and might increase the person's intrinsic motivation to engage in the activity. In the Activity dimension, the challenge and novelty of an activity are central to situational interest. People are likely to experience situational interest when the activity is optimally challenging or novel to them. Challenge is defined as the difficulty level associated with the activity and has been identified as a motivational factor that may attract individuals to engage in an activity (Harter, 1978). Novelty is conceptualized as information deficiency and has a function to elicit individuals' participation in an activity (Spielberger & Starr, 1994).

The *Social Context* dimension, as Deci (1992) delineated, is the environment in which all the above components interact to satisfy one's fundamental psychological need for competence, autonomy, and relatedness to fully experience situational interest. Alexander (2006) theorized that in different content domains the components contributing to motivation can vary. Thus, the construct is characterized by domain specificity. Recent research on situational interest in education has revealed that the dimension of interest is associated with the content in which it is situated. For example, situational interest dimensions in reading materials include novelty, intensity of action, character identification, life themes, and the story's imagery value (Krapp et al., 1992).

Conceptualizing the components as sources of situational interest, Midi (2001) further identified ease of comprehension, text cohesion, vividness, reader engagement, evocative emotional reactions, and prior knowledge and operationalized these as critical interest sources in reading tasks. She (1990, 2001) suggested that situational interest might emerge not only from the text features but also from the environment in which reading takes place. Mitchell (1993) identified

and operationalized "catching" and "holding" interests as dimensions of situational interest in mathematics. Situational interest, therefore, should be conceptualized as content and environment specific, because it is sensitive to both (Hidi, 1990, 2001).

To validate situational interest in physical education, Chen et al. (1999) measured middle school students' responses to high and low situationally interesting tasks. They hypothesized that for the construct to be valid, students' responses to highly interesting tasks would demonstrate the multidimensional characteristics articulated by Deci (1992). Deci tested seven dimensional components: novelty, challenge, attention demand, sense of delight, exploration intention, desire arousal, and time alteration. Factor-analytic procedures used on multiple data sets, including exploratory and confirmatory factor analyses, revealed a five-dimensional construct. The results of exploratory factor analysis suggested that desire and time alteration should be dropped from the original seven, and sense of delight was renamed as instant enjoyment. In addition, the confirmatory factor analysis further indicated that situational interest in physical education consists of five distinctive dimensions or sources: novelty, optimal challenge, attention demand, exploration intention, and instant enjoyment. Figure 1 presents a model of this validated construct. The Chen et al. (1999) finding also indicated that situational interest in physical education may be different from other content domains, such as reading or mathematics.

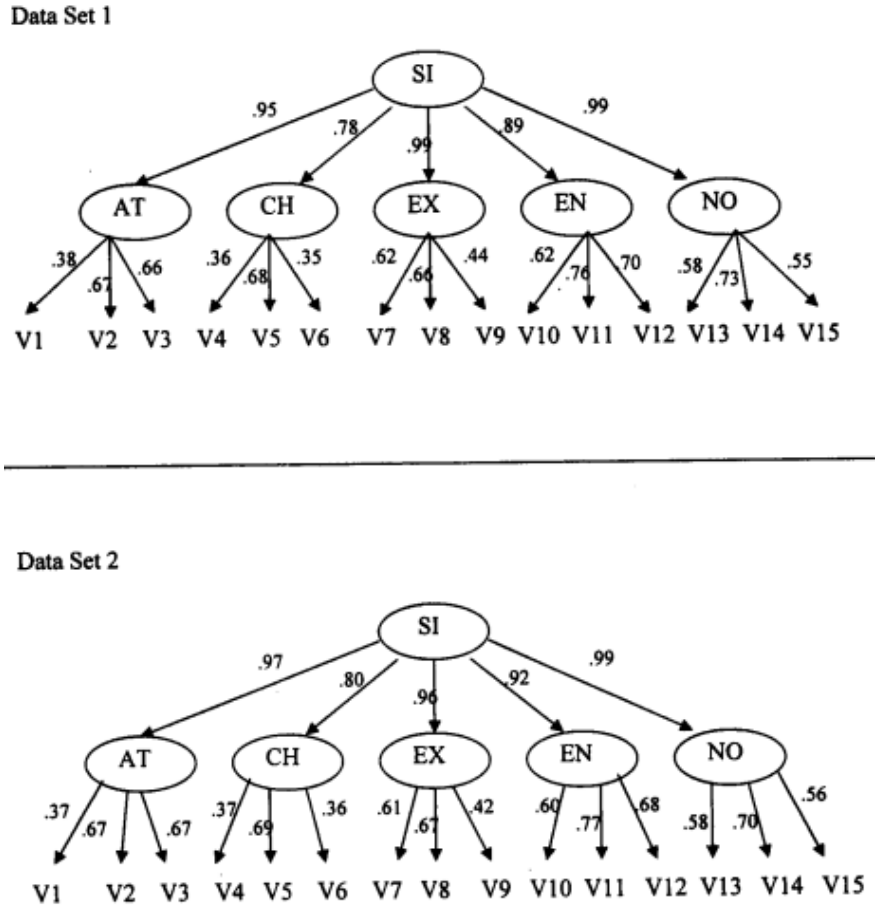

Figure 1. Confirmatory factor analysis; all pathways are significant (*Z* scores > 1.96); SI = situational interest; AT = attention demand; CH = challenge; EX = exploration opportunity; EN = instant enjoyment; NO = novelty.

The above studies in reading, mathematics, and physical education have provided strong evidence that the dimensional components theorized by Deci (1992) are highly sensitive in terms of content, environment, and individuals. Although situational interest has been tested repeatedly in middle school physical education (see Chen & Ennis, 2004), a replication validation is needed in elementary school physical education given the construct's sensitivity. A recent study (Chen, Ennis, Martin, & Sun, 2006) reported that the dimensional sources contributed differently to students' knowledge learning in physical education), which is inconsistent with findings from middle schools where little connection between situational interest and learning was identified (Chen & Shen, 2004; Shen & Chen, 2006). It is significant, then, to examine the extent to which the dimensions of interest in elementaryphysical education share a theoretical structure similar to that of middle school. The current study was designed for this purpose.

This study is significant in its attempt to verify a motivation construct important for elementary school physical education students. It is theorized (Alexander, Jetton, & Kulikowich, 1995) that situational interest is particularly helpful for and beneficial to novice learners (whose knowledge and skill are less well developed), such as elementary school students. At this stage, their motivation relies on situational interest (Alexander & Murphy, 1998). Verifying the dimensional sources in situational interest will enable teachers to identify, manipulate, and control motivation (Hidi, 2001) to enhance learning in physical education. Potentially, the study can provide a theoretical basis for developing curricula that enhance learning in elementary school physical education.

Method

Research Design

The purpose of this study was to examine the tenability of the situational interest dimensional sources in elementary school physical education. For this purpose, a two-sample, two-stage correlational confirmatory factor-analytical (CFA) research design was chosen to determine the structural relationships among measurable indicators and the underlying dimensions the indicators are intended to measure. As described in Figure 1, the indicators are measurable items (Vs) designated as components in a dimension (in oval circles in the middle), and the dimensions are the sources of situational interest. The a priori model shown in Figure 1 has been well articulated and examined in interest-based motivation research; thus, the approach in this validation study centers on testing the latent model.

We examined the hypotheses that the structure of situational interest would (a) hold, given that it was valid in middle school physical education, and (b) be stable as tested in two sample sets. We used two random student samples to test these hypotheses to provide reliable evidence for the construct.

Participants

Participants were third-, fourth-, and fifth-grade students (N= 5,717, Sample 1= 2,381, Sample 2 = 3,336) from 30 elementary schools randomly selected from urban and suburban areas of a large

metropolitan area in the eastern U.S. The sample included 48% girls and 52% boys from families with multicultural and low to middle class socioeconomical backgrounds, according to a 2003 school report. The students' racial characteristics were 71 % African American, 6% Caucasian American, 9% Mexican American, 2% Asian American, and 12% from other ethnic backgrounds. Institutional Review Board approval was obtained, and parents/guardians and students provided signed consent forms. Physical education was taught in 30 min. lessons twice a week in all participating schools.

The sample was highly representative of the 100 largest U.S. public school districts (National Center for Education Statistics, 2003). The schools represent 1% of all school districts in the country but serve 23% of children of which 69% are minorities, most of whom are African American. The sample for this study potentially extended the ecological validity of the results.

Variables and Instrument

The variables measured were five situational interest dimensions theorized in the literature. In middle school physical education, the dimensions were measured using the Situational Interest Scale (SIS; Chen et al., 1999), consisting of 24 items with 4 representing each dimension and a situational interest measure that included four items to elicit students' overall evaluation of the activities (total interest). All items were rated on a 5-point Likert-type scale referencing the physical education the students experienced during the previous 2 weeks. The criterion validity and construct validity of the Situational Interest Scale were tested in a previous study with middle school physical education students (Chen et al., 1999) and deemed satisfactory. In the previous study, internal consistency reliability coefficients were acceptable for the five domains, with Cronbach's alpha values ranging from .78 to .95.

The original scale (Chen et al., 1999) was revised for elementary school students in this study. To establish content validity, elementary school teachers (n = 7) read the items and evaluated their consistency with the dimensions. Teachers' expertise was determined by their participation in science and physical education curriculum writing teams for their respective school districts. They also examined the wording, language usage, and length for appropriateness for elementary school readers (second-grade level and up). The panel recommended shortening the instrument by deleting one item from each dimension and simplifying the scaling using a 4-point Likert-type scale to meet students' shorter attention span and weaker differentiating ability. We considered the recommendation by further studying theoretical statistics results related to the issue (Mueller & Hancock, 2001). Mueller and Hancock (2001) suggested that because the CFA proceeds with a model of the hypotheses to drive the variables (items in the scale), the model to be tested will not change by deleting a few items (Mueller & Hancock, 2001). In other words, because CFA does not proceed by forming composites of measured variables, it should not be a concern that we used a different number of variables (items) to form the composites. Thus, the CFA we conducted would allow us to successfully examine whether the situational interest model was grounded in elementary school physical education.

The original scale was then revised into a 15-item instrument with 3 items for each dimension. The rating scale was simplified, with written descriptors instead of numbers only. For example, an item for instant enjoyment read: "My PE classes in the past two weeks are..." with descriptor

choices of very exciting, somewhat exciting, rather dull, or very dull. The revised scale was piloted with a sample of third-grade nonparticipant students (n = 64) to further examine the appropriateness of reading levels. The students were instructed to indicate words and expressions that they did not understand, rather than rating the scale. Their feedback was incorporated in the final revision of the scale.

Data Collection and Analysis

Data were collected during the latter half of the 2003 fall semester. The items were read aloud to participants, who were instructed to respond to the SIS based on their experiences in physical education lessons during the previous 2 weeks. Children completed the scale independently. The data were collected by physical education teachers of the 30 participating schools who had been trained in data collection techniques and the administration protocol.

CFA was performed on separate covariance matrices from the data sets to test the construct validity of the dimensional structure of situational interest. CFA is a method that extracts factors (theoretical constructs) with predefined characteristics and then determines if the residual matrix still contains a significant proportion of variance (Gorsuch, 1983). Given the research purpose of this study, a CFA is the appropriate choice for the analysis. The use of CFA depends on a well established theoretically sound a priori model. The construct of situational interest was a sound basis for us to conduct a careful CFA analysis to examine the structure of dimensional sources in this sample.

Students' responses were randomly divided into two sets for analysis (n= 2,381 for Data Set 1; n = 3,336 for Data Set 2). The data achieved a normal distribution; therefore, the maximum likelihood solution was chosen as the algorithm in the analysis. The observed scores on each item were used as the dependent variables; the theorized dimensions of situational interest were named as the first-level latent variables. The situational interest was the second-level latent variable. To determine relationships among the five constructs, correlation analyses also were conducted.

Results

The goodness-of-fit indexes for both data sets showed that the five-dimensional structure held up well with the children's responses. Joint criteria recommended by Hu and Bender (1999) were used to evaluate the model of fit. According to them, the standardized root mean square residual (SRMR) can be used with one or more incremental or absolute fit indexes to determine the fit of the confirmatory factor model. SRMR was selected as a major metric for data-model fit, because it is less sensitive to sample size and violations of normal distribution. In addition, SRMR, among all the fit indexes, is the most sensitive to misspecification in both simple and complex models (Hu & Bender, 1999).

More specifically, data-model fit is considered good when the results meet one of the following criteria: nonnormed fit index, comparative fit index $\geq .96$ and SRMR $\leq .09$; or SRMR $\leq .09$ and root mean square error of approximation (RMSEA) $\leq .06$ (Hu & Bender, 1999). In this study, SRMR was .034 for Data Set 1 and.036 for Data Set 2; RMSEA was .047 for Data Set 1 and.050

for Data Set 2. The results indicated an excellent fit between the theorized dimensions and both data sets. This suggests that situational interest inelementary school physical education is determined by the same five sources identified in middle school physical education. The strong empirical evidence indicates that elementary physical education is grounded in the multidimensional situational interest model. Further, the CFA results also suggested that the hypothesized situational interest model was reliable. Reliability of the construct depends on whether the hypothesized constructs can be stable and replicable. The construct reliability coefficient was .876 and .872 for Data Sets 1 and 2, respectively.

In addition, the CFA has yielded acceptable construct validity at both structural levels. As shown in Figure 1, the 15 items were loaded coherently to their respective dimensions, with loading coefficients ranging from .35 to .76 and the statistical significance index Z ranging from 2.00 to 28.20 (significance level $Z > 1.96$). At the second level, the five dimensions had significant loadings ranging from .78 to .99 on the situational interest latent factor. The results from both data sets verified each other in the situational interest construct. Consistent with previous findings, a follow-up correlation analysis revealed significantly ($p < .01$) moderate and strong relationship between situational interest with instant enjoyment ($r= .79$), novelty ($r= .63$), attention demand ($r= .61$), exploration intention ($r= .55$), and optimal challenge ($r= .34$).

Discussion

This study examined the theoretical construct of situational interest, previously applied to middle school physical education, inelementary school physical education. The multidimensionality of si tuational interest was clearly demonstrated through the model validated in the CFAs. This is consistent with the Chen et al. (1999) theoretical model that delineates the dimensional sources of situational interest in middle school physical education. For this group of elementary school students, novelty, optimal challenge, attention demand, exploration intention, and instant enjoyment were clearly present. In other words, these five dimensions are necessary characteristics in physical education activities that facilitate their perception of situational interest. The strong, consistent loadings between the dimensional sources and situational interest in both data sets (see Figure 1) indicate that the dimensionality observed here had strong validity.

It is important to note that the relationship between the dimensions and situational interest is similar to that found in the study of middle school physical education (Chen et al., 2001). This finding indicates that dimensional sources of situational interest in physical education function across elementary and middle schools in that students at both levels are likely to be motivated by the same sources. Subtle differences, however, exist. For example, although the current model presents a relatively even distribution of association loadings between situational interest and its dimensional sources, the model derived from middle school students (Chen, Darst, & Pangrazi, 2001) showed a stronger association between instant enjoyment and situational interest. Chen et al, (1999, 2001) theorized that instant enjoyment contributes directly to situational interest and mediates the association between interest and other dimensions, such as novelty, exploration intention, and attention demand.

Chen and Darst (2001) found situational interest to be a function of learning design in middle school physical education by using the multidimensional theoretical framework of situational

interest (Chen et al., 1999). In addition, their study provided examples of learning activities from a situational interest perspective. Chen and Darst (2001) also found that students' perceived level of situational interest differed for different learning tasks. For example, students rated a basketball chest past task low in all situational interest dimensions, whereas they rated a pass-shoot high in all dimensions. The chest pass requires two students to stand about 15 feet [4.5 m] apart and use both hands to pass a basketball back and forth at chest height. The pass-shoot requires a group of students to focus on two balls and two partners simultaneously when dribbling and shooting. The pass-shoot, compared to the chest pass, is more challenging and requires participants to pay more attention. Students' different ratings in these two tasks clearly confirmed the notion that physical education teachers can increase students' interest by carefully designing the learning tasks according to the multidimensional situational interest model. The validated model from this study suggests that learning tasks similar to the pass-shoot may generate interest to enhance elementary school learners' motivation in physical education.

In addition, Chen and Darst (2001) reported that situational interest declined with age or years in middle school. Compared with middle school students, for whom instant enjoyment yielded more interest than other sources, elementary school students may be sensitive to all the dimensional sources. The correlation among any of the five dimensions and situational interest was strong, except for challenge, in which the association was moderate. The findings imply that elementary school students are likely to be drawn to an activity by any of the dimensional sources. Hypothetically, this finding may suggest that when one dimension is present, the students may quickly perceive a task as situationally interesting. Future research is needed to test this hypothesis to provide further empirical evidence.

These results also appear to provide insight into the critical, but little understood, concept of "fun." As a common conception of enjoyable experiences, "fun" is often used by students and teachers alike in physical education to describe a positive emotional outcome derived from the student-environment interaction in learning. In a physical education lesson, students are often expected to derive fun from learning tasks the teacher plans (Graham, Holt/Holt, & Parker, 2001; Wuest & Lombarde, 1993). In various documents, including physical education national standards (National Association for Sport and Physical Education, 2004) and curriculum texts (e.g., Graham et al., 2001; Wuest & Lombardo, 1993), it is not difficult to find that fun shares theoretical underpinnings or characteristics of situational interest: situation-based, manipulated by the teacher, instantaneous, and a learning motivator. Thus, the immediate environment can evoke fun in the physical education context and is characterized by events associated with content and instruction, such as the ways learning tasks are organized and presented (Ainley et al., 2002). Arguably, fun transcends the theoretical meaning of situational interest in a practical sense.

The observed multidimensionality of situational interest in this study suggests it might be an important component in our conceptual understanding of fun experiences. The model indicates that situational interest in elementary school physicaleducation is determined by cognitive aspects reflected in the strong association with students' recognition of novelty, optimal challenge, attention demand, and exploration intention. The emotional/affective involvement (Harp & Mayer, 1997)-instant enjoyment that is a dominant dimensional source of situational interest for adolescent learners (Kintsch, 1980; Schraw, Flowerday, & Lehman, 2001)-becomes

one with an equal function in formulating situational interest. These findings iterate the Chen and Darst (2001) argument that situational interest relies largely on the cognitive demand in learning experiences.

The multidimensionality of situational interest is a critical motivating source for learning. Based on the Domain Learning Theory (Alexander, 2006), for example, it is suggested that content should be structured consistent with situational interest for novice learners who have little individual interest in the content. The learner is often more concerned with getting through the task than developing competency or proficiency. Thus, at this stage, interest is more transitory or short-lived. In other words, it is more likely to be contextualized or situation-specific nature (Alexander, 1998). Elementary school students, most of whom are novice learners, need to experience well structured, situationally interesting learning experiences that lead to meaningful engagement in the content. The findings from this study seem to support this notion. Further, the findings may imply that physical education curriculum design should incorporate situationally interesting learning experiences to provide optimal learning experiences by emphasizing the five different dimensional sources.

Situational interest can potentially increase engagement and learning. Based on research in reading, Schraw et al. (2001) recommended focusing on increasing students' autonomy, providing more interesting text, and helping them process information at a deep level. They suggested teachers should offer students meaningful choices to promote autonomy and enhance situational interest. Hidi and Harackiewicz (2000) also suggested that by changing the way learning materials or tasks are presented the teacher can increase situational interest. To a certain extent, the findings of this study provide five potential possibilities for elementary school physical education teachers to design or manipulate learning tasks to enhance students' motivation. For example, teachers may choose one or two of the dimensional sources instead of incorporating all five to develop interest in learning tasks. However, fully understanding the interactive functions of the dimensions and their interactive contribution to intrinsic motivation needs further investigation. In addition, careful and sophisticated curriculum theorizing and school-based curriculum research are needed to fully incorporate the model of situational interest to formulate a useful theoretical platform for designing motivating curricula in both elementary and secondary physical education.

Conclusion

In this study, we found the five dimensional sources of situational interest in elementary school physical education to be valid and consistent with data from a large random sample of elementary physical education learners. Although structurally similar to the dimensional model found in middle school physical education (Chen et al., 1999), the model iterated in the CFAs in this study may suggest a strong independent effect of the dimensional sources rather than a strong integrated effect from multiple sources (Chen et al., 1999). The correlation analysis on interdimensional relations further confirmed that the five dimensions facilitated students' perception of situational interest in physical education. Thus, situational interest should be considered a critical component in the curricular/instructional process. The findings, however, should be interpreted based on the sample limitation, which was predominantly African American. Although it has been reported that students' response to situational interest in physical

education may be insensitive to certain demographic characteristics (Chen & Darst, 2002), caution should be used when generalizing the findings in different educational settings serving student populations with drastically different demographic characteristics.

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