What Constitutes Situational Interest? Validating a Construct in Physical Education

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Abstract:
Situational interest has been theoretically articulated as a multidimensional construct that derives from person—activity interaction. This 4-stage study empirically examined the multidimensionality of situational interest in physical education, using an iterative, multisample design. Middle school students (N = 674) were asked to view jogging and gymnastic stunts on video (in Stages 1, 2, and 3) and participate in basketball chest-pass and pass—shoot activities (in Stage 4). Immediately following each activity, situational interest of the activity was assessed by having the students respond to an instrument developed to measure the 7 dimensions of situational interest. Exploratory and confirmatory factor analyses were employed to examine the dimensionality of situational interest. The analyses revealed 5 dimensions of situational interest: Novelty, Challenge, Exploration Intention, Instant Enjoyment, and Attention Demand. A 24-item Situational Interest Scale was developed and revised during the 4-stage validation process. Cohen's (1988) d (effect size) indicated that the items possess the capability of distinguishing between responses to high interest versus low interest activities. Cronbach's α coefficients (1951) showed that the data from the instrument had acceptable internal consistency across the 5 dimensions.
Key words: situational interest, physical education, instrument validation

Article:
Interest has long been recognized as a motivation factor that guides children to learn (Renninger, Hidi, & Krapp, 1992). In everyday life, adults can find it difficult to direct children's attention away from what interests them. In education, it is common knowledge that students learn what interests them better than what does not. Interest embedded in a content plays an important role in attracting students to learn the content, and sometimes determines how well they learn it. Research evidence in physical education, although limited, seems to share this notion. Browne (1992) conducted a survey about secondary school female students' preferences for physical activities and their rational for selecting activity courses. She found that a fundamental rationale was their personal perception of how interesting an activity was.

Interest is generally defined as a psychological state that emerges from a person's interaction with an activity (Krapp, & Renninger, 1992). In educational research, it has been conceptualized as personal interest and situational interest (Krapp et al., 1992). Personal interest is a person's psychological disposition in preference of an activity or an action. It is often regarded as a personal preference stemming from individuals' conceptualization of knowledge, beliefs, and values. Personal interest is considered to have developed slowly over time during a person's constant and consistent interaction with certain activities in a particular environment. Therefore, it can be viewed as deriving from the formation of a person's knowledge repertoire and value system. Personal interest may motivate the learner, allow for correct and complete recognition of learning tasks, promote long-term storage of knowledge, and lead to meaningful learning (Schiefele, Krapp, & Winteler, 1992). Hidi and Anderson (1992) argued from a motivational perspective that personal interest is an especially important affective determinant in school learning. Personal interest can have a strong influence on how students select and persist in learning certain content as opposed to others. For instance, personal interest can motivate students to choose a history class over mathematics, or a football unit over aerobics. Because personal

interest is determined by knowledge and values about an activity, it is difficult to alter. Thus, utilizing each student's personal interest in school-based education is an extremely difficult task (Hidi & Anderson, 1992).

Because it is difficult to utilize students' personal interest in teaching, researchers recently have focused on situational interest, which is defined as the appealing effect of characteristics of an activity or a learning task on students (Hidi & Anderson, 1992). Situational interest depends on students' perceptions of specific features that an activity can offer as they encounter it (Mitchell, 1993). In other words, situational interest is an interactive psychological state that occurs at the moment there is a match between a person and an activity. Although under studied, situational interest has been examined under competing theoretical frameworks that are usually specified within particular academic domains. For example, Schraw, Bruning, and Svoboda (1995) used a six-dimension construct that describes the interest particularly pertaining to reading in college students. Hidi and Anderson (1992) adopted the personal—situational dichotomy framework in their study of situational interest in learning expository writing. Yet, others (Frick, 1992; Hidi & Baird, 1986) studied situational interest and its effects on achievement under a single component structure of "interestingness," or a polarized structure of "holding" and "catching" interest (Mitchell, 1993).

To articulate a theoretical structure of intrinsic motivation and the function of situational interest, Deci (1992) proposed a general, multidimensional construct. He argued that situational interest cannot be conceptualized and measured as a standalone concept. It should be defined in three person—activity interactive categories: (a) activity feature, (b) mental disposition, and (c) interactive experience. Each category consists of several functional components, the effects of which, presumably, lead the person, to a psychological state of being interested in an activity.

In the activity category, Novelty and Challenge are the functional components. Novelty, conceptualized as a gap between information known and unknown, or information deficiency, has a function to elicit human beings' exploratory behavior (Berlyne, 1966; Spielberger & Starr, 1994). Defined as the level of difficulty relative to one's own ability, Challenge has been identified as a factor that may attract students to engage in an activity (Harter, 1978). In the mental disposition category, Exploration Intention, Desire Arousal, and Time Alteration are the functional components. They represent the power of stimulation that can be observed in such activities as puzzles, brain teasers, and "weird" mathematical problems (Mitchell, 1993). These functional components are likely to arouse a person's instant perception of situational interest in the activity, and may increase the person's intrinsic motivation to engage in it (Deci, 1992). In the interactive experience category, the functional components include Attention Demand and Sense of Delight, occurring when the person engages in the activity. They serve as the basis on which the person develops and evaluates the degree of enjoyment offered by the activity. Each of the functional components forms a unique dimension that plays a role in evoking the person's sense of relatedness to the activity. Thus, situational interest should be measured in terms of these dimensions in order to produce valid data.

Despite the above theoretical articulation, the multidimensionality of situational interest has not been examined empirically, as related to physical education. In other words, whether or not the dimensions articulated can be observed in physical activities is still at issue. In fact, minimal research has been conducted to examine situational interest in physical education. The purposes of this study were twofold: (a) examining the multidimensionality of situational interest in a school physical education setting, and (b) developing a multidimensional scale to measure situational interest in this setting.

The significance of this study lies in the exploration of situational interest, a unique motivator for students' learning in physical education. Although many motivational theories, such as intrinsic/extrinsic motivation (Deci & Ryan, 1985) and goal theory (Duda, 1993; Nicolls, 1984), compete in education and physical education, few studies from these theoretical traditions have directly addressed the issue of engaging students in immediate learning tasks on hand, Recent research in physical education has shown that learning is mediated by students' cognition about learning tasks and contexts (Lee, 1997; Solmon & Lee, 1997), and that students' lack of interest in learning tasks has become one of the critical problems leading to disengagement in learning (Ennis

et al., 1997). This study may provide useful information about how different characteristics in physical activities—such as novelty, challenge, and enjoyment—can function to enhance students' engagement when they encounter learning activities in class. In addition, clarifying the construct of situational interest can help us understand how students perceive physical activities in terms of situational interest. Thus, the findings are likely to provide a theoretical foundation for teachers to design learning tasks that appeal to students.

We assumed in this study that situational interest is characterized by personal subjectivity. In other words, observation of situational interest depends on a person's comparative preference to comparable activities that possess features dichotomizing high and low interest (Deci, 1992). It is an important assumption that leads to a belief that validation for situational interest measures can only be accomplished when participants are provided a dual comparison environment in which two or more comparable activities can be empirically differentiated in terms of the activity features (Frick, 1992; Reeve, 1993). It was hypothesized that the measures of situational interest be validated when participants' responses to an activity of high interest show a coherent multidimensional pattern in factor analyses.

METHODS

A four-stage iterative design was used in this study. Each stage was an independent investigation in terms of participants (samples), data collection, and data analysis. The design of the entire study is iterative in that each previous stage served as a base on which the next stage was conducted. Table 1 provides a description of the stages, In the first stage, statements to be used to measure situational interest were prepared. Each of the dimensions was represented by a group of statements. The purpose of the second stage was to examine whether situational interest was a multidimensional construct, as it was theoretically articulated, using an exploratory factor analysis. In the third stage, the preliminary factor model elicited in the second stage was examined using a confirmatory factor analysis. In the fourth stage, the construct of situational interest resulting from the previous stages was reexamined in actual physical movement learning tasks. The purpose for this stage was to replicate the analyses done in the previous two stages and determine whether the construct of situational interest could hold when students were participating in physical activities.

TABLE 1
Stages of Data Collection and Analysis

	Stage 1	*Stage 2*	*Stage 3*	*Stage 4*
Purpose	Item development	Multidimensionality examination	Multidimensionality verification	Multidimensionality verification
Sample size	189	201	89	191
Stimulus activity	Videotaped jogging and gymnastic stunts	Videotaped jogging and gymnastic stunts	Videotaped jogging and gymnastic stunts	Basketball chest-pass and pass–shoot drills
Instrument	Item evaluation instrument	Situational Interest Scale	Revised Situational Interest Scale	Revised Situational Interest Scale
Data analyses	Examining distinguishing capability of items using Cohen's *d* (effect size)	Exploratory factor analysis, Cronbach's α	Confirmatory factor analysis, Cronbach's α	Exploratory and confirmatory factor analyses, Cronbach's α

Statements Selection

The pool of statements was developed in two phases. First, key words synonymous to each functional component were identified by Ang Chen. Included in a pool of 137 words were 19 for Novelty, 20 for Challenge, 23 for Attention Demand, 14 for Sense of Delight, 30 for Exploration Intention, 21 for Desire Arousal, and 10 for Time Alteration. The key words in the pool were considered to have exhausted possible expressions that could be used to describe the meaning of each dimension. They were then attached to the

definitions of the dimensions (Deci, 1992). The three researchers independently assessed the consistency of the key words with the definitions of their respective dimensions, In each dimension, the key words that were considered by all researchers as consistent with the dimensional definition were selected and placed in an instrument, the Situational Interest Scale (Draft). The screening resulted in a total of 64 key words consistent with their definitions. The range of statements distribution across the dimensions was from 8 (Novelty) to 12 (Exploration Intention).

Second, a statement was written for each word. Each statement situated the meaning of the word in terms of physical activities. Sample statements for each dimension can be found in Table 2. Also added were four statements to elicit students' overall evaluation of situational interest in the activities (Total Interest): "This activity is interesting," "The activity looks fun to me," "It is fun for me to try this activity," and "This is an interesting activity for me to do." AU the statements were randomly placed in the Situational Interest Scale (Draft) for testing with middle school students. Specific instructions were written asking students to evaluate how well each statement described their current feelings about the activity on a 5-point Liken scale ranging from 1 *(very untrue)* to 5 *(very true).*

TABLE 2
Decriptives of Items and Cohen's *d* (*N* = 189)

	Gymnastics		*Jogging*		
Item	*M*	*SD*	*M*	*SD*	*Cohen's d*
Total Interest					
This activity is interesting.	3.60	1.17	2.16	1.17	.61
The activity looks fun to me.	3.87	1.27	2.06	1.21	.73
It is fun for me to try this activity.	3.56	1.02	1.82	1.00	.86
This is an interesting activity for me to do.	3.74	1.20	1.86	1.17	.83
Novelty					
This activity is new to me.	4.28	1.19	2.10	1.16	.96
This is a new-fashioned activity for me to do.	3.60	1.28	2.04	1.22	.61
This activity is unusual.	3.28	1.19	2.05	1.17	.52
I have never seen this activity before.	3.11	1.38	1.97	1.30	.43
This activity is fresh.	3.43	1.27	2.39	1.33	.40
This is an exceptional activity.	3.48	1.25	1.44	1.38	.78
Challenge					
It is a complex activity.	3.94	1.32	2.12	1.25	.71
This activity is difficult to do.	4.31	1.30	2.24	1.32	.79
It is hard for me to do this activity.	3.94	1.28	2.38	1.30	.60
This activity is a demanding task.	3.42	1.33	1.62	1.26	.69
This activity looks like an adventure to me.	3.43	1.31	2.33	1.27	.42
This activity is complicated.	3.56	1.15	1.46	1.33	.85
Attention demand					
I was focused.	3.48	1.32	1.91	1.19	.63
I was alert all the time.	3.51	1.28	2.38	1.23	.45
My attention was high.	3.52	1.21	2.10	1.21	.59
I was concentrated.	3.87	1.18	2.19	1.28	.68
I was absorbed.	3.66	1.18	2.08	1.21	.66
I was very attentive all the time.	3.56	1.29	1.91	1.16	.67
I was completely engaged.	3.95	1.32	2.11	1.19	.73
Sense of delight					
It is an enjoyable activity to me.	4.09	1.30	2.11	1.18	.80
I was attracted by the activity.	3.06	1.34	2.05	1.15	.41
I felt satisfied.	3.16	1.23	2.20	1.20	.40
This activity is fascinating.	4.21	1.20	2.18	1.16	.86
This activity is exciting.	4.13	1.22	1.55	1.49	.95
I was delightful.	3.69	1.17	2.19	1.18	.64
Exploration intention					
I want to discover all the tricks in this activity.	3.17	1.21	2.15	1.19	.43
I like to find out more about how to do it.	3.92	1.32	2.09	1.19	.73
I like to inquire into details of how to do it.	3.15	1.21	2.08	1.12	.46
I want to check how it was done.	4.17	1.27	2.17	1.21	.81
I have to detect the details in the activity.	3.22	1.30	2.04	1.03	.48

(*Continued*)

TABLE 2 (*Continued*)

Item	Gymnastics M	Gymnastics SD	Jogging M	Jogging SD	Cohen's d
I want to analyze it to have a grasp on it.	3.87	1.26	1.98	1.12	.79
Desire arousal					
The activity inspires me to participate.	3.61	1.30	2.16	1.19	.58
This activity is inviting for my participation.	3.44	1.30	2.09	1.17	.55
This activity is appealing to me.	3.26	1.27	2.05	1.13	.50
This is an arousing activity to do.	3.82	1.37	2.10	1.33	.63
This activity engaged me in trying it.	3.23	1.24	2.05	1.16	.49
This activity is enticing.	3.52	1.33	2.16	1.19	.54
Time alteration					
Time seemed to pass by unnoticed.	4.22	1.40	2.45	1.35	.64
I was unaware of time passage.	3.38	1.32	2.10	1.17	.53
Time seemed going slow. (Reversed scoring)	3.16	1.37	1.85	1.14	.52
Time appeared going fast.	3.18	1.36	2.12	1.31	.40
Time was going quicker than usual.	3.61	1.45	2.14	1.34	.52
I felt that time stopped.	3.45	1.47	2.00	1.18	.55

Stimulus Learning Activities

To measure the situational interest, a dual comparison measurement environment was used, in which students had an opportunity to compare two activities and respond according to their perception of situational interest in each. The rationale for using this approach was that the construct of situational interest had not been empirically examined in both education and physical education settings. Thus, taking the measurement in a complicated task situation, such as when students were participating in physical activities, might involve other factors unrelated to but affecting their responses to the scale, such as fatigue, over-excitement, and other types of emotional instability associated with participating in physical activities. In addition, using this dual comparison measurement environment could reduce the possibility of spurious conclusions that might derive from simply correlating measures of dimensional statements with Total Interest without knowing the extent of situational interest perceived by students. In this dual comparison environment, a low interest activity, identified with low ratings on Total Interest, could be used as a reference frame in which the meaning of students' responses to the activity of higher interest could be determined quantitatively.

Videotaped physical activities. Jogging and gymnastic stunts were videotaped and shown to the students as stimulus activities to elicit their responses in Stages 1, 2, and 3. The two activities were assumed to have contrasting features that reflect different levels of situational interest. The jogging video showed people jogging in different places and in different groupings. The gymnastic stunts video showed people doing front and back rolls, cartwheels, front and back flips, and various trampoline activities. The two activities were performed by local university students and videotaped by the researchers in regular physical education settings to minimize the arousal effects that could result from viewing performances in competitive events. Each videotaped activity was edited into a 2-min video clip.

Participatory physical activities. In Stage 4, a basketball chest-pass and a pass—shoot task were used as stimulus activities to contrast students' responses. The chest-pass required that two students stand about 15 ft apart and pass a basketball back and forth using the chest-pass skill. The pass—shoot required students to focus on two balls' and two partners' movements simultaneously when completing dribbling, passing, and shooting tasks (see Figure 1 for details). The purpose of using the two tasks was to set up a participatory dual comparison environment so that the data representing responses to the task with higher interest of the two were collected at the moment when the students were participating in the task.

Participants

The entire sample involved in the four stages included 674 middle school students (51% boys, 49% girls), representing seventh, eighth, and ninth grades evenly. They were recruited from a school in the suburb of a major metropolitan area in the southwestern United States. Racial characteristics of the students in the school

were considered representative of the student population in the area, which comprised 3% African American, 71% White, 20% Mexican American, 5% Native American, and 1% Other. The participants in the sample were 3% African American, 69% White, 23% Mexican American, 4% Native American, and 1% Other. All the students participated in required daily physical education classes taught by certified physical education specialists. Although male and female students were instructed separately, they shared equal access to the activity resources, facilities, and equipment. Parental consent and student consent were obtained from all participants. Table 1 reports the sample sizes in each stage.

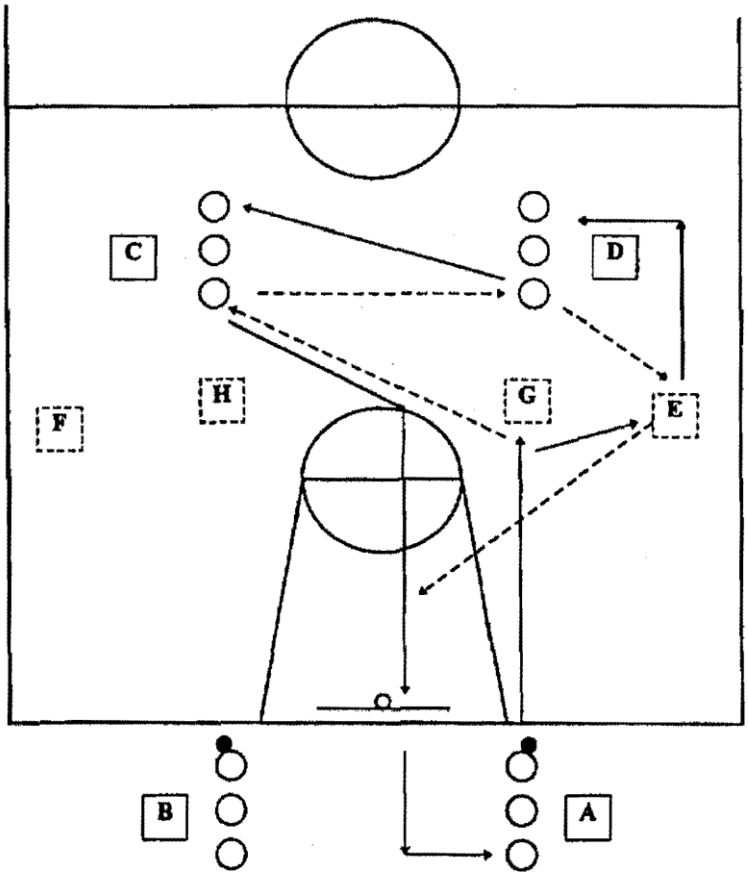

FIGURE 1 Diagram of pass–shoot task. A dribbles to G, passes to C, then moves to E; C passes to D, then starts cutting to the basket; D passes to A (in E), then moves to end of C; A (in E) passes to C (cutting through), then moves to end of D; C makes shot and rebound, then moves to end of A. B starts the same task simultaneously by dribbling to H and moving to F and passes to the next person in D. The task is run in the opposite way.

Data Collection

Data collection is iterative. In Stages 1, 2, and 3, the data collection procedure followed the same protocol: Students in groups of about 30 (in their natural classes) viewed videotaped jogging and gymnastic stunts and completed the Situational Interest Scale (Draft) after viewing. The data collection sessions were organized by the researchers, with assistance from the teachers, and lasted about 40-min each. The sequence of showing the videotaped activities was randomly determined by the researchers.

In Stage 1, after viewing each activity, students independently rated the 68 statements in terms of how each statement described their feelings when viewing the activity. Students' responses were then analyzed to determine the statements' capability to distinguish between the two activities. Based on the analysis, statements were selected for use in the next stage. In Stage 2, immediately after viewing each activity, the students were instructed to respond to the statements selected in Stage I. In Stage 3, they responded to a shorter scale generated from Stage 2. The data were analyzed to verify the dimensionality that emerged in Stage 2.

In Stage 4, data on the basketball chest-pass were collected 1 week before the pass—shoot task because of the school's unique weekly short- and long-period alternating schedule. The students had approximately 5 min of full practice in chest-pass and 15 min in pass—shoot. On both occasions, the students responded to the Situational Interest Scale immediately after the task. They were instructed to rely on their experiences with the activity, to work independently, and to address all questions to the researchers. Maximum equipment was used on both occasions, so that each participant had ample opportunity to experience the activities. The practices were organized and the data were collected by the researchers and trained graduate assistants. The teachers assisted with class management in the process.

Data Analysis

In Stage 1, Cohen's effect size, $d = (\mu_1 - \mu_2) / \sigma$, (1988) was computed to determine the extent to which a statement's means from the two measurement occasions (jogging vs. gymnastics) was distinguishable, in terms of high and low interest. A value of d was arbitrarily decided as a criterion for selecting a necessary number of statements in each dimension that could distinguish between responses to high- and low-interest activities.

Factor analyses were conducted in Stages 2, 3, and 4 to examine the multidimensionality of situational interest. In Stage 2, students' responses to the activity that was rated as having higher situational interest in the video comparison (jogging vs. gymnastics) were examined using an exploratory factor analysis. In Stage 3, the model elicited in Stage 2 was analyzed using confirmatory factor analysis. In Stage 4, in which the participatory stimulus activities were used, an exploratory factor analysis was performed on students' responses to the activity that was rated as having higher situational interest (chest-pass vs. pass—shoot), to examine the multidimensionality of the situational interest observed in the previous stages. A confirmatory factor analysis was also conducted to further verify the dimensionality. However, the confirmatory factor analysis was independent from the results of the exploratory factor analysis. It was based on the construct verified in Stage 3. The purpose of performing both factor analyses in this stage was to replicate the analyses done in the previous two stages, to examine whether there were any discrepancies in terms of the structure of the dimensional measures when students responded in a participatory setting. During the factor analyses, assumptions for the analyses were examined. Throughout the four stages, Cronbach's α coefficients (1951) were computed to determine item internal consistency in each dimension.

It should be pointed out that data from a Liken-type scale are ordinal in nature. They are commonly treated, however, as interval data in educational research. We took this common approach in order to interpret the results of statistical analyses, in terms of "extra-mathematical grounds" (Hays, 1973, p. 89), for an understanding of situational interest in physical education learning settings. The reader is advised to take necessary precaution when interpreting the results.

RESULTS

Stage 1

Cohen's d was estimated using the formula $(M_1 — M_2) / SD_{pooled}$. The computed d values ranged from .18 to .96 for all 68 statements. A criterion of d= .40 was arbitrarily decided for statement selection. This criterion indicated that a statement was considered to have distinguishing capability when the difference of its means from the two occasions (gymnastic stunts vs. jogging) was at least .40 of a pooled standard deviation unit or larger. This criterion was rigorous enough to eliminate low distinguishing statements, and moderate enough to maintain a relatively large statement pool for developing the Situational Interest Scale. As reported in Table 2, 43 dimensional statements met the criterion. The data showed that gymnastic stunts were the activity of high interest when compared with jogging, The Cronbach's internal consistency coefficients (α; 1951) for the seven dimensions ranged from .78 to .89.

Stage 2

The 43 dimensional and 4 Total Interest statements were used in this stage. The data (N = 201) were also subject to the examination of distinguishing capability. Results from Cohen's d computation demonstrated similar distinguishing capabilities for the statements, with d ranging from .42 to 1.11. The exploratory factor

analysis was conducted on students' responses to gymnastic stunts to validate the multidimensionality of the situational interest measures. Testing of the sphericity assumption yielded a Bartlett's (1950) sphericity coefficient of 1854.08 (p = .001, with df = 300), indicating that the correlation matrix was not an identity matrix and that the correlation strength among the ratings was adequate for a factor analysis. To test the correlation adequacy assumption, the Kaiser-Meyer-Olkin (KMO; Kaiser, 1974) was used to compare the magnitudes of observed correlation coefficients with those of partial correlation coefficients. The logical reason for the test is that when partial correlations among pairs of variables are substantially high, or even higher than the zero-level correlation, the construct elicited from the subsequent factor analysis will be flawed and possibly meaningless. The KMO coefficient, based on the responses to the gymnastic stunts, was .88, very close to the "marvelous" level of .90 for correlation adequacy (Kaiser, 1974, p. 35). These results showed that a reliable, meaningful factor construct of situational interest could be generated from the data.

The least-square factor extraction was used to provide a solution that was accounted for by the contributions of statement variances to each dimension as well as to the entire construct of situational interest. This approach is meaningful because of its ability to take into account each dimension's importance (represented by its accounted variance) in the factor extraction. The equamax rotation with Kaiser normalization (1974) was used to simplify the construct. This approach possesses the strengths from both varimax and quartimax rotations to take into account both factor structure and interrelationship of the statements. Factors with an eigenvalue greater than 1.0 (Kaiser, 1960) were retained in the model.

The factor analysis generated six factors (dimensions). As reported in Table 3, all the statements from Exploration Intention dimension are concentrated in the first factor. The second factor is primarily loaded with statements originally from Sense of Delight and Desire Arousal dimensions. The third factor mainly consists of all Novelty statements. The fourth factor includes all the original statements from Attention Demand. The fifth factor is loaded with the original statements from Challenge. The sixth factor is loaded with three statements from the Sense of Delight and Desire Arousal dimensions. A close examination of the meaning of the statements suggested that it was a redundant factor because the statements duplicated the meaning of those in the second factor. Consequently, this factor was not considered to be an independent dimension. Time Alternation dimension was dissolved with its statements being loaded separately on different factors. These five dimensions were named Exploration Intention, Instant Enjoyment, Novelty, Attention Demand, and Challenge, respectively. The total variance accounted for by the five dimensions was 52.80%, slightly better than one half of the variance.

A revision of the scale was made according to the factor analysis results. The misloaded Time Alteration statements were considered theoretically inadequate and were subsequently deleted from the scale. In addition, the scale was shortened so that it did not require much time to administer in a regular physical education class. Four statements with the highest loadings in each dimension were used in the new version of the scale. Cronbach's α coefficients (1951) for the revised scale were .88, .88, .72, .73, and .63 for Exploration Intention, Instant Enjoyment, Novelty, Attention Demand, and Challenge, respectively. This revised Situational Interest Scale consisted of 20 dimensional statements, 4 from each dimension, and the 4 statements for Total Interest. These statements were randomly arranged in the scale to be used in Stages 3 and 4.

Stage 3

Students in the third sample (N = 89) completed the revised Situational Interest Scale, Cohen's d (1988) ranged from .54 to 1.05 for the 24 items and from .75 to 1.12 for the five dimensions and Total Interest. In confirmatory factor analysis, the maximum likelihood approach was adopted to calculate factor estimates using LISREL 8 (Jöreskog & Sörbom, 1993). Figure 2 provides a description of the factor and residual (error) estimates accounted for by each statement toward its respective dimension. These estimates show a relatively coherent loading of the statements on their respective dimensions elicited from the exploratory factor analysis.

#	Statements	Stage 3 Factor/Residual[a]	Stage 4 Factor/Residual	Dimension
9	I want to analyze it to have a grasp on it.	.80/.37	.85/.28	
14	I want to discover all the tricks in this activity.	.71/.50	.93/.14	Exploration Intention
7	I like to find out more about how to do it.	.78/.40	.89/.21	
24	I like to inquire into details of how to do it.	.79/.38	.80/.36	
13	It is an enjoyable activity to me.	.72/.48	.72/.48	
1	This activity is exciting.	.85/.28	.85/.28	Instant Enjoyment
22	The activity inspires me to participate.	.83/.32	.88/.23	
10	This activity is appealing to me.	.80/.36	.88/.23	
16	This activity is new to me.	.77/.41	.65/.58	
15	This activity is fresh.	.66/.57	.80/.36	Novelty
12	This is a new-fashioned activity for me to do.	.75/.43	.78/.39	
8	This is an exceptional activity.	.60/.64	.72/.48	
4	My attention was high.	.84/.29	.88/.23	
6	I was very attentive all the time.	.89/.21	.88/.23	Attention Quality
17	I was focused.	.78/.39	.81/.34	
18	I was concentrated.	.73/.47	.87/.24	
2	It is a complex activity.	.68/.54	.79/.38	
3	This activity is complicated.	.68/.54	.79/.38	Challenge
20	This activity is a demanding task.	.77/.41	.71/.50	
23	It is hard for me to do this activity.	.64/.59	.71/.50	

FIGURE 2 Factor and residual estimates from confirmatory factor analysis. [a]From Maximum Likelihood method; squared value of a factor estimate = variance of the statement accounted for by what it is intended to measure; residual = variance of the statement due to unmeasured error.

The assessment of model—data fit was drawn from examining a group of recommended statistics, and is reported in Table 4. Although the conventional χ^2 index does not suggest a fit ($p = .03$) between the construct and the data (Jöreskog & Sörbom, 1993), the χ^2 / df ratio is 1.22, meeting the fit criterion of 3 or less recommended by Carmines and McIver (1981). Both Goodness-of-Fit Index and Adjusted Goodness-of-Fit Index are below the threshold of .90 criterion, indicating a weak but acceptable fit (Bentler, 1990). However, both Nonnormed Fit Index and Comparative Fit Index are higher than the acceptable value of .90. In addition, the Root Mean Square Error of Approximation meets a fit criterion of .05 or less for a close model—data fit (Browne & Cudeck, 1993). Taken together, these results indicate an overall model—data fit.

TABLE 3
Statement Loadings on Dimensions from Stage 2 Data

Item	*Original Dimension*	*Exploration Intention*	*Instant Enjoyment*	*Novelty*	*Attention Quality*	*Challenge*	*Other*
Exploration intention							
I want to analyze it to have a grasp on it.	EI	**.90**	.25	.14	−.01	.17	.35
I want to discover all the tricks in this activity.	EI	**.86**	.32	.07	.12	.17	.00
I like to find out more about how to do it.	EI	**.84**	.36	.11	.17	−.08	.34
I like to inquire into details of how to do it.	EI	**.81**	.26	−.19	.20	.33	.07
I want to check how it was done.	EI	**.75**	.40	.11	.26	−.11	.31
I have to detect the details in the activity.	EI	**.70**	.13	−.03	.30	.00	.15
Time was going quicker than usual.	TA	**.69**	.33	.24	−.19	.16	.05
Instant enjoyment							
It is an enjoyable activity to me.	SD	.28	**.86**	.24	.30	.28	.19
This activity is exciting.	SD	.32	**.75**	.05	.27	.17	−.16
The activity inspires me to participate.	DA	.51	**.75**	−.21	.49	.30	.15
This activity is appealing to me.	DA	.39	**.72**	.38	.00	.41	.37
This is an arousing activity to do.	DA	.48	**.70**	.08	.24	.16	.00
I was attracted by the activity.	SD	.47	**.69**	.17	.23	.00	.00
This activity is fascinating.	SD	.24	**.68**	.16	.29	.12	.38
This activity is inviting for my participation.	DA	.26	**.61**	.11	.03	.23	−.37
I felt satisfied.	SD	.33	**.60**	.30	.17	−.19	.15
Time appeared going fast.	TA	.39	**.57**	.08	.00	.27	.00
Novelty							
This is an exceptional activity.	NV	.21	.28	**.86**	.27	.23	.17
This activity is fresh.	NV	.19	.17	**.86**	.20	.00	.00
This activity is new to me.	NV	.21	.06	**.84**	.18	.00	.11
This is a new-fashioned activity for me to do.	NV	.13	.31	**.80**	.00	.35	.00
I have never seen this activity before.	NV	.21	.30	**.65**	.06	.23	.00
This activity is unusual.	NV	.12	.17	**.58**	.07	.21	.00
Time seemed going slow.	TA	.25	.04	**.51**	−.25	.24	.55
Quality of attention							
My attention was high.	QA	.42	.08	.13	**.80**	−.16	.00
I was very attentive all the time.	QA	.35	.27	.30	**.72**	.00	.00
I was concentrated.	QA	.32	.14	.07	**.68**	−.13	.00
I was focused.	QA	.33	.29	.20	**.60**	.00	−.18
I was alert all the time.	QA	.15	.31	.28	**.64**	.10	.12
I was absorbed.	QA	.06	.41	.42	**.58**	.34	.00
I was completely engaged.	QA	.05	.47	.02	**.58**	.17	−.16
Time seemed to pass by unnoticed.	TA	.33	.25	.17	**.55**	−.30	.00
Challenge							
It is a complex activity.	CH	.19	−.14	.11	.18	**.88**	.00
This activity is complicated.	CH	.34	−.14	−.22	.19	**.88**	.14
This activity is a demanding task.	CH	.13	.26	.28	.02	**.82**	.18
It is hard for me to do this activity.	CH	.08	.28	.09	.00	**.76**	.00
This activity is difficult to do.	CH	.19	.21	−.19	.24	**.72**	.27
This activity looks like an adventure to me.	CH	.17	.22	−.23	.00	**.59**	.00
I felt that time stopped.	TA	.27	−.06	−.34	.00	**.58**	.00
I was unaware of time passage.	TA	.15	.24	.22	.24	**.57**	.00
Other							
This activity engaged me in trying it.	DA	.11	−.09	.33	.00	−.02	**.57**
I was delightful.	SD	.08	.15	.26	−.13	.00	**.55**
This activity is enticing.	DA	.22	.21	.13	.10	.00	**.50**
Percent of Variance (Total = 52.80)		14.59	13.67	8.98	8.63	6.94	5.19
Eigenvalue		8.54	1.95	1.64	1.23	1.08	1.02

Note. EI = exploration intention; SD = sense of delight; DA = desire arousal; NV = novelty; CH = challenge; AT = quality attention; TA = time alteration.

TABLE 4
Confirmatory Factor Analysis Indexes of Fit Test Results

Index	*Stage 3*	*Stage 4*
Chi-square (χ^2)	196.38 ($p_{160} = .03$)	647.43 ($p_{237} < .01$)
χ^2/df ratio	1.22	2.73
Goodness-of-Fit Index (GFI)	.87	.93
Adjusted Goodness-of-Fit Index (AGFI)	.76	.96
Nonnormed Fit Index (NNFI)	.94	.94
Comparative Fit Index (CFI)	.95	.90
Root Mean Square Error of Approximation (RMSEA)	.05	.02

Although the construct can be conceptualized as consisting of dimensions independent from one another, an interdependent relationship among the dimensions is more realistically interpretable. The interdimensional relationship was assessed in the comfirmatory factor analysis. The results, as reported in the first block of Table 5, did suggest that the dimensions in the situational interest construct had such an interdependent relationship. To further assess the relationship, a correlation analysis was conducted on composite scores of the dimensions, with the samples in Stages 2 and 3 combined (N= 294). As expected, the correlation coefficients indicated a interdimensional relationship within the construct.

Stage 4

Results from the above three stages of the study suggest that the theoretically articulated construct of situational interest is observable when measured in a dual-comparison environment. The analyzed dimensional data demonstrated that the 24-statement Situational Interest Scale produced valid and reliable measures of situational interest in middle school students when they were engaging in conceptual tasks (i.e., watching and contrasting two activities on video, in this case). At this stage of the study, the question that needed to be addressed was whether the measures were still valid in interpreting situational interest when students were actually participating in physical activities.

TABLE 5
Dimensional Correlation Coefficients

	Novelty	*Challenge*	*Exploration*	*Enjoyment*	*Attention*	*Interest*[a]
Stage 3 sample ($N = 89$)[b]						
Novelty	1.00					
Challenge	.48*	1.00				
Exploration	.84*	.35*	1.00			
Enjoyment	.71*	.40*	.70*	1.00		
Attention	.76*	.45*	.58*	.66*	1.00	
Stage 2+3 sample ($N = 290$)[c]						
Novelty	1.00					
Challenge	.56*	1.00				
Exploration	.52*	.50*	1.00			
Enjoyment	.41*	.42*	.70*	1.00		
Attention	.38*	.38*	.46*	.51*	1.00	
Interest	.32*	.22	.54*	.67*	.34*	1.00
M/SD	3.30/0.85	2.94/1.06	3.10/0.98	3.64/1.00	3.42/0.96	3.81/1.33
Stage 4 sample ($N = 191$)[c]						
Novelty	1.00					
Challenge	.57*	1.00				
Exploration	.56*	.38*	1.00			
Enjoyment	.61*	.32*	.76*	1.00		
Attention	.67*	.51*	.57*	.66*	1.00	
Interest	.60*	.29	.77*	.90*	.70*	1.00
M/SD	3.01/1.09	3.05/1.07	2.86/1.19	3.30/1.14	3.58/1.04	3.36/1.17

[a]Total interest. [b]From confirmatory factor analysis. [c]From composite scores.
*$p < .01$, two-tailed.

A total of 191 students completed the scale in this stage. As can be seen in Table 6, the computed Cohen's *d* (1988) for all the statements met the .40 criterion. The exploratory factor analysis with least-weighted extraction and equamax rotation yielded a five-dimension solution based on the new data. As can be found in Table 6, all statements but one from Novelty were loaded on their original dimensions, with factor loadings ranging from .54 to .84. The five-factor solution accounted for 66.80% of total variance. Because misloading of only one statement cannot be taken as substantial evidence indicating dimensional changes in a factor solution (Pedhazur & Schmelkin, 1991), the original five-dimensional structure was imposed on the data in a confirmatory factor analysis. Results of this analysis, as reported in the Stage 4 column of Figure 2, showed that all statements had loading and residual coefficients similar to those found in Stage 3. As reported in Table 4, although χ^2 (847.43, $df = 237$, $p = .01$) indicated unfit, other indexes showed an improved model—data fit. These results combined provide valid evidence of the data that supports situational interest as a multidimensional construct observable in a participatory physical education setting. Similarly, the interdependent relations among the dimensions were also evident in this sample of data (see third block of Table 5).

TABLE 6
Statement Loadings on the Five Dimensions From Stage 4 Data

	Pass		*Shot*							
Statements	*M*	*SD*	*M*	*SD*	*d*	*Explore*	*Enjoy*	*Attention*	*Challenge*	*Novelty*
Exploration intention										
I want to discover all the tricks in this activity.	3.39	1.19	2.02	0.90	.65	.77	.35	.29	.00	.20
I like to find out more about how to do it.	3.33	1.33	1.98	0.95	.59	.73	.32	.16	.16	.18
I want to analyze it to have a grasp on it.	3.13	1.38	1.76	1.02	.57	.70	.29	.15	.16	.23
I like to inquire into details of how to do it.	3.61	1.17	1.98	0.91	.78	.64	.29	.20	.24	.00
Instant enjoyment										
This activity is exciting.	4.66	1.28	2.19	0.97	1.12	.35	.73	.20	.00	.19
It is an enjoyable activity to me.	4.53	1.22	2.29	1.25	.91	.35	.71	.37	.00	.21
This activity is appealing to me.	4.00	1.37	2.55	1.42	.52	.50	.62	.25	.00	.15
The activity inspires me to participate.	4.14	1.17	2.31	0.98	.85	.41	.58	.33	.00	.19
This is an exceptional activity.[a]	3.42	1.29	1.98	0.87	.66	.37	.57	.35	.19	.15
Attention quality										
I was concentrated.	3.09	1.31	2.33	1.12	.47	.26	.12	.81	.21	.21
I was focused.	3.47	1.31	1.30	1.08	.91	.11	.26	.68	.23	.21
I was very attentive all the time.	4.11	1.48	2.17	1.37	.68	.27	.36	.60	.23	.25
My attention was high.	4.34	1.31	2.35	1.10	.83	.13	.36	.60	.29	.31
Challenge										
This activity is complicated.	3.99	1.41	2.21	1.17	.69	.00	.00	.24	.76	.14
It is a complex activity.	3.93	1.35	2.45	1.35	.55	.00	.22	.17	.70	.20
It is hard for me to do this activity.	4.19	1.58	1.66	1.14	.93	.19	.00	.00	.56	.35
This activity is a demanding task.	3.61	1.19	1.58	1.09	.90	.20	.00	.19	.54	.27
Novelty										
This activity is new to me.	3.57	1.20	1.61	1.04	.88	.00	.00	.12	.27	.76
This is a new-fashioned activity for me to do.	3.34	1.29	2.00	0.85	.63	.16	.00	.31	.28	.67
This activity is fresh.	4.00	1.32	2.28	1.25	.67	.21	.42	.19	.17	.57
Percentage of variance (Total = 66.80%)						15.61%	15.20%	14.00%	11.26%	10.73%
Eigenvalue						9.51	2.38	1.96	1.28	1.04

Note. Assumption tests: (a) Bartlett's Sphericity: $\chi^2_{(df\ 190)} = 2672.88$, $p < .001$; (b) Kaiser–Meyer–Olkin coefficient = .93.
[a]The misloaded statement, original dimension: Novelty.

Internal consistency reliability.

An improved internal consistency was achieved for the scale. Cronbach's α coefficients (1951) were .78, .80, .90, .91, .90, and .95 for the five dimensions and Total Interest, respectively. The results suggest that the Situational Interest Scale developed along this validation process can generate reliable data for examining middle school students' perceptions of situational interest in both conceptual and participatory learning tasks.

DISCUSSION

We hypothesized that (a) situational interest could be observed when the participants were able to distinguish a high interest activity from a low one, and (b) the measures of situational interest could be validated when students' responses to a high interest activity showed a coherent multidimensional pattern in both exploratory and confirmatory factor analyses. The computed Cohen's *d (1988)* values for the statements in the scale demonstrate that high- and low-interest learning tasks can be observed and distinguished empirically using the Situational Interest Scale. The high correlation of Total Interest with Instant Enjoyment and Exploration Intention suggests that perception of situational interest is likely to reflect students' emotional and cognitive preference to the activities.

The multidimensionality of situational interest was clearly observed through both exploratory and confirmatory factor analyses. Although five dimensions, instead of seven, as theoretically articulated (Deci, 1992), were observed in the factor analyses, the three major categories of person—activity interaction described in the theoretical framework (activity, mental disposition, and interactive experience) are all represented in the elicited factor models. This result further supports Hidi and Baired's (1986) observation that interest in an activity or learning task can only be perceived in "the interaction of stimulus and person" (p. 184). Further, the multidimensionality suggests that "thinking of interest as a general arousal experience is inadequate" (p. 191). Instead, it should be considered to be a process where learners are "responding to the significance of information" (p. 191) that is embedded in the activity. Based on the elicited construct, novelty and challenge are two necessary characteristics in an activity that facilitate perception of interest. On the other hand, an activity will not attract students without the two mental dispositions: high level of attention demand and exploration intention. In addition, students will be less likely to perceive the activity as interesting unless their engagement in it results in a positive and enjoyable interactive experience. Thus, enhancing students' interest should involve improving their emotional engagement with the activity so that they may generate a feeling of instant enjoyment.

A close examination of the factor solution revealed that the five dimensions may not account equally for situational interest. The variances accounted for by individual dimensions in the least square factor extraction provide a comparable basis on which the importance of each dimension can be assessed. It appears that situational interest can be manifested in two major dimensions, Exploration Intention and Instant Enjoyment. The two dimensions accounted for 14.59% and 13.66% of total variance for the conceptual task and more than 15% for the participatory task, respectively. It is noticeable that Novelty and Attention Demand each accounted for a lower variance than the above two. The study provides a piece of empirical evidence to support the notion that "only when the needs or desires of the [person's] self mesh with the activity will the person experience interest" (Deci, 1992, p. 46). It seems that characteristics in an activity that arouse students' intention to explore and provide instant enjoyment are the primary components of situational interest. In contrast, it can be logically speculated that novelty and challenge aspects in an activity play a less important role than do those that elicit exploration behavior and produce instant enjoyment. It should be pointed out that the five dimensions accounted for only 52% and 66% of total variance of situational interest in conceptual and physical learning tasks, respectively. It seems that a large portion of variance is not accounted for. It can be speculated that the variance unaccounted for might be due to variables associated with the teaching/learning process such as teaching styles, grouping, and/or length of a class, rather than the learning tasks. Taken together, the findings are significant in that they point to a direction for future research on the internal relationships among the dimensions.

Although a causal—effect relationship cannot be determined given the purpose and design of the study, the correlation analyses among the dimensions demonstrates a pattern to their interdependency. Dimensional correlation estimates from the confirmatory factor analysis (see Table 5) demonstrate a high correlation among Novelty, Exploration Intention, Instant Enjoyment, and Attention Demand. In the replicated correlation analysis between the dimensions and Total Interest using a larger sample, the relationship pattern is evidently similar (see Table 5). It can be found by examining the correlation coefficients that Total Interest has higher correlations with Exploration Intention and Instant Enjoyment than those with other dimensions. Especially noticeable is its relatively low correlation with Novelty and Challenge. Although Challenge was not highly

correlated with any dimensions, the highest correlation it did have is with Exploration Intention and Instant Enjoyment. Similar correlation patterns with these two dimensions can also be observed in Novelty. It may be hypothesized that the relationship of Novelty or Challenge with Total Interest was mediated by the effect of Exploration Intention and Instant Enjoyment. Based on this evidence, it can be speculated that the five dimensions are likely to be the sources that facilitate situational interest in learning physical activity.

The relationship among the dimensions and Total Interest supports the notion that situational interest be conceptualized in research as an independent construct. Hidi and Anderson (1992) pointed out a need to conceptually distinguish situational interest from curiosity. They suggested that, although both curiosity and situational interest represent a psychological arousal resulting from information deficiency about an activity, each generates a different emotional response in the person interacting with the activity. Perception of interest generates a pleasant emotion, resulting in the person's continued engagement with the activity. In contrast, curiosity generates conflicting emotions or uncertainty for a person. A positive emotion, such as enjoyment, may result, which motivates the person to further engage in the activity. A negative emotion, such as fear, may also result, which prompts the person to avoid the activity in the future. Based on this notion, the fact that Total Interest had higher correlations with Exploration Intention and Instant Enjoyment than with Novelty and Challenge indicates that the five-dimensional construct is theoretically sound. It also suggests that the extent of situational interest should be determined by measuring students' information deficiencies (Novelty) about and emotional responses (Instant Enjoyment) to an activity, rather than relying solely on the measures of Total Interest.

This study has raised several questions for future research. The most immediate question that should be addressed is how to interpret the interdependent relationship among the dimensions. Research on interest and its effects on learning in many subject areas (Renninger et al., 1992) has shown that there may be a complex relationship among the dimensions. Their combined effects may have a stronger impact than their individual effects on students' eventual perception of situational interest. Research is also needed to explore the direct association between situational interest, students' motivation at different learning stages, and learning achievement. This research will shed light on our understanding of whether learning tasks perceived as interesting can lead to high levels of student engagement and achievement in physical education.

REFERENCES

Bartlett, M. S. (1950). Tests of significance in factor analysis. *British Journal of Psychology,* 3, 77-85.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107,* 23824.6.

Bedyne, D. E. (1966). Curiosity and exploration. *Science, 153,* 25-33.

Browne, .1. (1992). Reasons for the selection or nonselection of physical education studies by year 12 girls. *Journal of Teaching in Physical Education, 11,* 402-410.

Browne, M. W., & Cudeck. R. (1993). Alternative ways of assessing model fit. In K. A. Bolien & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury Park, CA: Sage.

Carmines, E. G., & McIver, J. P. (1981), Analyzing models with unobserved variables: Analysis of covariance structures. In G. W. Bohrnstedt & E. F. Borgatta (Eds.), *Social measurement: Current issues* (pp. 65-115). Newbury Park, CA: Sage.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16,* 297- 334.

Deci, E. L. (1992). The relation of interest to the motivation of behavior: A self-determination theory perspective. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 43-69). Hillsdale, Ni: Lawrence Erlbaum Associates, Inc.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

Duda, J. L. (1993). Goals: A social cognitive approach to the study of achievement motivation in sport. In R. Singer, M. Murphey, & L. K. Tennant (Eds.), *Handbook of research in sport psychology* (pp. 421-436). New York: Macmillan.

Ennis, C. D., Cothran, C. J., Davidson, K. S., Loftus, S. J., Owens, L., Swanson, L., & Hopsicker, P. (1997). Implementing curriculum within a context of fear and disengagement. *Journal of Teaching in Physical Education, 17,* 52-71.
Frick, R. W. (1992). Interestingness. *British Journal of Psychology, 83,* 113-128.
Harter, S. (1978). Pleasure derived from optimal challenge and the effects of extrinsic rewards on children's difficulty level choices. *Child Development, 53,* 87-97.
Hays, W. L. (1973). *Statistics for the social sciences* (2nd ed.). New York: Holt, Rinehart & Winston. Hidi, *S., &* Anderson, V. (1992). Situational interest and its impact on reading and expository writing. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.). *The role of interest in learning and development* (pp. 215-238). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
Hidi, S., & Baired, W. (1986). 1nterestingness-A neglected variable in discourse processing. *Cognitive Science, 10,* 179-194.
Jöreskog, K. G., & Sörbom, D. (1993). *LISREL*® 8: *Structural equation modeling with the SIMPLISTm command language.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20,* 141-15 I.
Kaiser, H. F. (1974). An index of factoral simplicity. *Psychometrika, 39,* 31-36.
Krapp, A., Hidi, S., & Renninger, K. A, (1992). Interest, learning, and development. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 1-26). Hillsdale, *NJ:* Lawrence Erlbaum Associates, Inc.
Lee, A. M. (1997). Contributions of research on student thinking in physical education. *Journal of Teaching in Physical Education, 16,* 262-277.
Mitchell, M. (1993). Situational interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology, 85,* 424-436.
Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective *experience,* task choice, and performance. *Psychological Review, 91,* 328-346.
Pedhazur, E. J., & Schmelkin, L. P. (1991). *Measurement, design, and analysis:* An *integrated approach.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc,
Reeve, J. (1993). The face of interest. *Motivation and Emotion, 17,* 353-375.
Renninger, K. A., Hidi, S., & Krapp, A. (Eds.). (1992). *The role of interest in learning and development.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
Schraw, G., Bruning, R., & Svoboda, C. (1995). Sources of situational interest. *Journal of Reading Behavior,* 27,1-17.
Shiefele, U., Krapp, A., & Winteler, A. (1992). Interest as a predictor of academic achievement: A meta-analysis of research. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 183-212). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
Solmon, M. A., & Lee, A. M. (1997). Development of an instrument to assess cognitive processes in physical education classes. *Research Quarterly for Exercise and Sport, 68,* 152-160.
Spielberger, C. D., & Starr, L. M. (1994). Curiosity and exploratory behavior. In H. F. O'Neil, Jr., & M. Drillings (Eds.), *Motivation: Theory and Research* (pp, 221-243). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.