An examination of situational interest and its sources in physical education

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Chen, A., Darst, P. W., & Pangrazi, R. P. (2001). An examination of situational interest and its sources in physical education. *British Journal of Educational Psychology, 71(3)*, 383-400.

Abstract:

Background. Situational interest is articulated theoretically as a construct associated with five dimensional sources: novelty, challenge, attention demand, exploration intention, and instant enjoyment.

Aims. This study aimed to examine the influence of the dimensional sources on situational interest. It was hypothesised that the dimensional sources function differently to contribute to situational interest and that the influence of a source might be mediated by others.

Sample. Two samples of 7th, 8th, and 9th grade students were used in the study. There were 281 students (57% male, 43% female) in the first sample and 191 (47% male, 53% female) in the second.

Method. Students in Sample A evaluated situational interest and the dimensional sources in tasks of analysing jogging and gymnastic stunts on video. Those in Sample B evaluated them in tasks of learning basketball. Correlation and regression analyses and path analyses were used to test the theoretical model.

Results. Instant Enjoyment determined situational interest. Exploration and Novelty had positive influences on situational interest via enhancing Instant Enjoyment. Challenge showed little influence. The path analyses for both samples confirmed the inter-dimensional mediation effects of the sources.

Conclusion. The analysed data support the hypotheses. The dimensional sources had unequal influences on situational interest and the mediation effects among themselves at times strengthened or weakened each other's influences. The findings suggest that to increase situational interest, educators should offer students ample exploratory opportunities during student-task interaction that can lead to instant enjoyment for learning.

Article:

Interest has been considered an energiser and regulator of behaviour throughout the human life. In education, it is presumed that interest can integrate students' experiences outside the school in the learning process, encourage students to use prior knowledge in pursuing new knowledge, and motivate them to engage in learning tasks at hand (Dewey, 1913). Research findings have supported these arguments and have clarified the function of interest in education conceptually as well as empirically (Hidi, 1990; Renninger, Hidi, & Krapp, 1992).

Interest is defined generally as a positive psychological state that is based on or emerges from person-activity interaction. Krapp, Hidi, and Renninger (1992) suggest that interest be conceptualised as personal interest and situational interest. Personal interest is defined as a person's preference for one activity over others. It is developed over time through a person's constant and consistent interaction with the activity. Thus, personal interest can be viewed as evolving along with a person's knowledge repertoire and value system. It allows recognition of the meaning in a learning task, leads to meaningful learning behaviours, promotes long-term storage of knowledge, and provides motivation for continued engagement in learning (Schiefele, Krapp, & Winteler, 1992). Hidi and Anderson (1992) argue, however, that personal interest is narrowly focused and difficult to alter. Therefore, using each student's personal interest to facilitate learning a particular subject in the school can be an extremely difficult task for teachers.

Recently, educational researchers have focused on situational interest in an effort to explore its potential for motivating students to learn. Situational interest is defined as the appealing effect of an activity or learning task on an individual, rather than the individual's personal preference for the activity (Hidi & Anderson, 1992). It is described as an interactive or relational construct because it `flows from a person's relationship with a particular activity' (Reeve, 1996, p. 170). In learning, situational interest results from students' recognition of the appealing features associated with a specific learning task (Mitchell, 1993). Situational interest has been found to have unique short-term and long-term motivational effects on the learner in the areas of mathematics, reading, and history (Renninger *et al.*, 1992). It has been considered a powerful motivator that guides learners to participate in learning (Deci, 1992).

As an independent construct, situational interest and its effects on learning have been studied under competing theoretical frameworks. These frameworks differ in the number of components involved in defining situational interest and its sources. For example, Schraw, Bruning, and Svoboda (1995) described situational interest pertaining to reading tasks in college students using a six-dimensional construct that included text cohesion, ease of comprehension, vividness, prior knowledge, engagement, and emotiveness. Hidi and Anderson (1992) adopted a personal- and situational-interest dichotomy that was specified in learning expository writing. They assumed that situational interest involved two components: novelty and positive feelings generated by novel tasks or information. Yet others studied situational interest effects on learning using a single component structure of `interestingness' (Frick, 1992; Hidi & Baird, 1986) or a polarised construct of `holding' and `catching' interest in science and mathematics (Mitchell, 1993). Although these different conceptualisations have contributed to a deeper understanding of situational interest, they delineate *what* situational interest is in a subject domain rather than *how* situational interest is related to its situational and psychological sources in a general sense (Deci, 1992; Tobias, 1994).

Deci (1992) proposed a general theoretical model delineating situational interest and its situational and psychological sources. He argued that when a person interacts with an activity he/she is able to report situational interest in three person-activity interactive categories: activity, mental disposition, and interactive experience. Each category consists of several dimensional sources. In the activity category, Novelty and Challenge are the dimensional sources. Novelty, conceptualised as a gap between information known and unknown or information deficiency, has been thought to be a unique function that can motivate a person's exploratory behaviour (Berlyne, 1966; Spielberger & Starr, 1994). Challenge, defined as the level of difficulty relative to a person's ability, has been identified as a factor that may attract the person to engage in an activity (Harter, 1978). In the mental disposition category, Exploration Intention, Desire Arousal, and Time Alteration are the dimensional sources. They represent the effects of stimulation that can be observed in activities such as puzzles, brainteasers, and `weird' mathematics problems that demand concentrated cognition and mental energy (Mitchell, 1993). In the interactive experience category, the dimensional sources include Attention Demand and Sense of Delight that are occurring when the person engages with the activity. The seven dimensional sources are considered to be essential factors that intrinsically motivate a person to engage in an activity and lead the person to an instant feeling of being interested (Deci, 1992).

This multidimensional theoretical model is conceptually important in that it describes seven situational and psychological sources functioning together to evoke a sense of personal relatedness to the activity. The model is methodologically important because it suggests that observation of situational interest is valid only when its situational and psychological sources are also observed in the person-activity interaction. In other words, these situational and psychological sources are considered components of situational interest when individuals make personal evaluations of the `interestingness' of an activity (Frick, 1992; Hidi & Baird 1986).

Although the relationship between situational interest and its sources has been acknowledged for some time, these sources have rarely been measured as part of situational interest construct in empirical studies. In most research, interest is measured as a single-component construct using self-report approaches without a common comparable reference frame. Tobias (1994) noticed that when measuring interest, researchers used a self-reference frame where participants designated their interest levels in terms of individual preferences rather than

a comparative reference frame. For instance, a respondent might rate a reading passage as highly interesting by contrasting it with another passage in the textbook, while another respondent might rate the same passage low interest by comparing it with playing video games. In this measurement environment, Tobias (1994) pointed out, the internal validity of the data becomes questionable because high and low interests are not based on a common reference point. He recommended that interest be measured in a contrasting environment where levels of interest can be determined on the basis of comparable experiences.

Interest is cognitive in nature. Situational interest measures should be based on the characteristics of the material being used in measurement, rather than on personal prior knowledge about the material. The situational interest can be confounded by prior knowledge when measured with reading-based tasks, such as reading a passage or solving a mathematical problem, which rely on individuals' prior knowledge (Tobias, 1994). According to Tobias, reading-based measures may introduce measurement `noise' (p. 45) because responses to situational interest measures are likely to be determined by prior knowledge about the reading material, rather than its characteristics situated in the person-activity interaction. The confounding effect can be greater when situational interest is measured after reading-based tasks are completed. In this case, perceived difficulty in the tasks might have prevented the respondents from recognising the characteristics of the material that might be situationally interesting otherwise (Tobias, 1994). Using reading-based situational interest measurement presents even greater difficulty for exploring the relationship of situational interest and its sources because the relationship can only be measured after individuals have experienced it.

These issues suggest that studying the relationship of situational interest with its sources requires designing a measurement environment where situational interest is measured with non-reading activities and on a basis of activity comparison rather than personal preferences. It seems that situational interest is similar to other cognition-based, person-activity interactive affect such as flow state (Csikszentmihalyi, 1990). It should be measured when the person is engaged in a high interest activity in reference to a low interest activity. Measuring situational interest of one activity in reference to that of others may improve the internal validity of the data (Frick, 1992).

Using a dual-activity comparison environment and physical activities rather than reading-based tasks, Chen, Darst, and Pangrazi (1999) validated the multi-source construct (Deci, 1992). They used two learning tasks in basketball to provide a common comparative reference frame for determining high or low situational interest. The study involved four samples of middle school students (N = 674). The data were analysed using a multi-stage factor analysis strategy including both exploratory and confirmatory factor analyses.

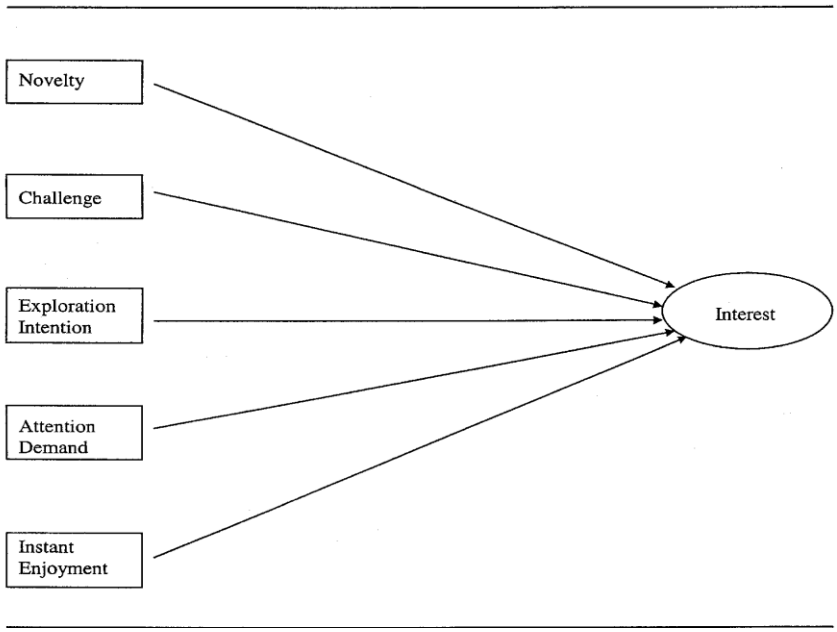
The analysed data supported a construct with five dimensional sources, instead of seven. They include Novelty, Challenge, Attention Demand, Exploration Intention, and Instant Enjoyment. The five-dimensional construct was stable in both exploratory and confirmatory factor analytical procedures. In other words, these dimensions were identifiable when contrasting students' responses to the high interest activity with those to the low interest activity. The inter-dimensional relationships revealed in the same study appeared to support the theoretical model, suggesting that situational interest is dependent upon the five dimensions.

The current study was designed to determine the influence of dimensional sources on situational interest based on Chen *et al.*'s empirical model and Deci's theoretical elaboration. The original (null) model to be tested is described in Figure 1. The first hypothesis to be examined was that the five sources function differently to contribute to situational interest. For this purpose, we examined how each dimensional source related to and predicted situational interest. We predicted that the extent to which each source related to and predicted situational interest would be different. This prediction was based on various findings from different content domains (e.g., Mitchell, 1993; Schraw *et al.*, 1995).

The second hypothesis was that each dimensional source might influence and/or be influenced by other sources. This hypothesis suggested that the effect of a source on situational interest might be mediated by other sources, making its influence to a greater or lesser extent. For this purpose, we proposed and tested a hypothetical path

model based on the theoretical articulation of the dimensional mediation effects (Chen *et al.*, 1999; Deci, 1992). Examining this hypothesis allowed us to identify the role of each dimensional source in situational interest so that educators can use these sources to promote situational interest effectively.

Figure 1. Initial model of situational interest and sources



To address the measurement concerns, we chose to conduct this study in physical education. In physical education, students' cognitive and affective responses to learning tasks are independent of reading-based materials (Wersch, Trew, & Turner, 1992). The physical learning tasks are less likely to confound the cognitive measure of situational interest.

The study is significant in both theoretical and practical perspectives. Theoretically it attempted to identify the relationship of the dimensional sources in the well-articulated model of situational interest. The clarity of the model may be improved with the empirical evidence gathered and tested in the study. Practically the study may bring understanding of how each source contributes to situational interest in a real learning setting. Findings of this study may provide useful information for educators to adjust the dimensional sources in learning tasks to enhance situational interest. It is possible that the information can facilitate curriculum developers to design learning tasks that are interesting and motivating.

Method

Participants

The participants were middle school students (N = 472, 51% male, 49% female) from a major metropolitan area in the southwestern United States. They represented the 7th (age M = 12.76, SD = .54), 8th (age M = 13.82, SD = .57), and 9th (age M = 14.94, SD = .51) grades evenly. The students were divided in two samples. The first sample consisted of 281 students (57% male, 43% female). The second sample included 191 students (47% male, 53% female). The students were from urban and suburban families with multicultural and low to middle class socio-economic backgrounds, as reported by the school and district officials. Racial characteristics of the students in the sample were 4% African Americans, 66% Caucasian, 19% Mexican American, 6% Native American, and 5% from other ethnic backgrounds. Parental approval and student consent forms were received prior to the data collection. All the participants were informed of the right to withdraw from the study if they wished to do so.

Instrument

Situational interest was measured using the Situational Interest Scale (Chen *et al.*, 1999). The scale consists of 24 five-point Likert type items (5 = strongly agree, 1 = strongly disagree) to measure levels of students' feelings

about each item in terms of the activity they are experiencing. All the items were randomly placed in the scale. Appendix 1 presents the items as categorised in their dimensions.

Novelty, Challenge, Attention Demand, Exploration Intention, and Instant Enjoyment dimensions are each represented by four items. Also included are four items to elicit students' overall evaluation of situational interest of the activities (Total Interest). They are: `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'. Chen *et al.* (1999) have shown that all the items can be used to effectively define high and low interest in activities.

The construct validity was established using both exploratory and confirmatory factor analyses with multiple student samples (Chen *et al.*, 1999). The five dimensional sources and Total Interest have been observed consistently in factor analyses. Exploratory factor analyses showed that all items loaded in their respective dimensional sources with values ranging between .64 and .90. The five sources accounted for 53% of the total variance in Total Interest when students responded to conceptual tasks (watching video, etc.), and 67% of total variance when responding to physical activities (basketball shooting drills, etc.). Results from confirmatory factor analyses indicated a fit of the data and the proposed model (e.g., GFI = .93, AGFI = .96, RMSEA = .02). The item internal consistency coefficients (Cronbach's α) are: .78, .80, .90, .91, .90, and .95 for Novelty, Challenge, Attention Demand, Exploration Intention, Instant Enjoyment, and Total Interest, respectively (Chen *et al.*, 1999).

Stimulus learning activities

The data were collected when students experienced two sets of learning tasks in video-viewing and participatory learning occasions. Immediately after each task, the students responded to the Situational Interest Scale. It was assumed that the data collected in this way provided high- and low-interest information that preserved the internal validity of situational interest (Csikszentmihalyi, 1990; Frick, 1992).

Videotaped physical activities. Jogging and gymnastic stunts were videotaped and shown to the students to elicit their responses in Stage 1. The purpose was to examine whether the theoretical model could be supported with empirical data. The two activities were subjectively selected and assumed to have contrasting features indicating different levels of situational interest. The jogging video showed people jogging in different places and in different groupings. The gymnastics video showed people doing front- and back-rolls, cartwheels, front and back flips, and various trampoline activities. Both videos featured local university students in regular physical education classes (as opposed to high-level competitive events) to minimise possible arousal effects. Each video was edited into a two-minute video clip.

Participatory physical activities. In Stage 2, a pair of physical activities was used as stimulus activities to form a participatory comparative measurement environment. The purpose of using physical activities was to further examine whether the inter-dimensional relationship described in the theoretical model could be observed when students were taking part in physical activity learning tasks. A basketball chest-pass and a pass-shoot task were used to contrast students' responses. Basketball was chosen because it is a major physical activity offered in most middle school physical education curricula. The chest pass required that two students stand about 15 feet apart and pass a basketball back and forth. The pass-shoot required students to focus on two balls' and two partners' movements simultaneously when dribbling, passing, and shooting. According to the teachers, the chest-pass was used in most basketball classes, while the pass-shoot was never used in the classes. Appendix 2 describes this learning task in detail.

Data collection

In Stage 1, students in the first sample viewed the videotapes of jogging and gymnastic stunts separately in their physical education classes (approximately 30 students in each). The sequence for showing the videotapes was randomly determined by the researchers on site. After viewing each activity, the students were instructed to independently rate the items in the Situational Interest Scale. During the data collection sessions, the researchers distributed the scales, gave instructions about the procedure, answered questions, controlled the video display

devices, and collected the completed scales. Teachers responsible for the classes were present and helped organise student seating. Each data collection session lasted about 30 minutes.

In Stage 2, students participated in the basketball chest-pass and pass-shoot tasks and responded to the Situational Interest Scale immediately after each task. They had approximately five minutes of full practice with the chest-pass and 15 minutes in the pass-shoot. After instruction, data were collected by the researchers and trained graduate assistants. The teachers assisted in class management during the data collection. Maximum equipment was used so that each student had ample opportunity to experience each task. When responding to the Situational Interest Scale, students were instructed to base their decisions on their experiences with the activity, to work independently, and to address all questions to the researchers.

Data analysis

In the analysis, scores from the four items in each dimension and Total Interest were summed. A preliminary analysis was conducted to determine the level of high- and low-interest of the activities. In the analysis, Cohen's effect size ($d = (\mu_1 — \mu_2)/\sigma$), 1988) was computed for the composite dimensional means scores of the paired activities. The *d* coefficients were then used to determine the degree of confidence that a high interest activity could be distinguished from a low interest activity in each dual measurement environment. Cohen's *d* is statistical evidence that shows a response's scaling difference between two means based on the population standard deviation unit of the measure (Stevens, 1990). In this study, Cohen's *d* was estimated using $(M_1 - M_2)/SD_{Pooled}$ (Stevens, 1990). Using this index enabled us to reasonably determine the extent to which the paired activities differed in terms of situational interest measures.

The model examination process was progressive. The examination of the first hypothesis involved (a) correlation and partial correlation analyses to identify the inter-dimensional relationships among dimensions and Total Interest and (b) multiple regression analyses with Total Interest as the criterion and dimensional measures as predictors to explore possible dimensional differentiated effect on situational interest. The second hypothesis was examined using path analyses of dimensional and Total Interest measures to determine the extent to which the dimensional sources mediated each other's impact on situational interest (Deci, 1992).

Path analysis is an analytical approach of structural equation modelling. Although arguable, path analysis has been acknowledged by researchers in biology, psychology, social science, and education as an acceptable approach for examining directional or causal-effect relationships based on its capability to test the directional effects among correlates of correlational data (Marcoulides & Schumacker, 1996). Using this analysis, an empirical model can be specified according to a theoretical model and statistically tested against the theoretical model using a matrix algorithm. Based on the correlation among the dependent (endogenous) and independent (exogenous) variables, a reproduced correlation or covariance matrix is generated using a maximum likelihood approach in most cases. Then, the observed and reproduced matrices are compared to test the goodness-of-fit between the two with the direction of the relationship (sources and effects, or causes and effects) taken into account. More often than not, it is necessary to make adjustments on variables and directions to improve the goodness-of-fit between the reproduced matrix (structural model) and the observed matrix (data). With the adjustment, researchers add or delete paths among variables based on (a) theoretical articulations, (b) information from related analyses such as correlation, partial correlation, and regression analysis, and (c) various indices generated from the path analysis itself.

Results

Table 1 shows that the participants rated the videotaped gymnastic stunts and basketball pass-shoot drill higher in every dimension than the jogging and basketball chest-pass tasks. Cohen's *d* ranged from .47 to .78 for the dimensions. The indices offered us medium to high confidence (Cohen, 1988) that the two activities differed in situational interest. The subsequent analyses were based on student responses to the gymnastic stunts and pass-shoot learning tasks.

Table 1. Descriptive data and Cohen's *d* for dimensional sources and Total Interest

	Total Interest *M*/SD	Attention *M*/SD	Challenge *M*/SD	Enjoyment *M*/SD	Exploration *M*/SD	Novelty *M*/SD
Gymnastic Stunts	3.66/1.31	3.38/1.01	3.09/.97	3.43/.100	3.06/1.05	3.28/.97
Jogging	1.94/1.06	2.43/1.02	2.14/.92	1.98/.91	2.13/.92	2.16/.87
(N = 281)	d = .73	d = .47	d = .50	d = .76	d = .47	d = .61
Pass-Shoot	3.36/1.17	3.58/1.04	3.05/1.07	3.30/1.14	3.86/1.19	3.10/1.09
Chest-Pass	2.06/.64	2.61/.72	1.95/.78	2.22/.67	2.28/.83	2.15/.89
(N = 191)	d = .72	d = .55	d = .60	d = .60	d = .78	d = .48

Correlation and partial correlation analyses

As reported in Table 2, the correlation coefficients from both gymnastic stunts and pass-shoot data showed that Instant Enjoyment had a stronger correlation with Total Interest (r = .67 for the gymnastics video, r = .90 for basketball pass-shoot) than did any other sources. In other words, Total Interest is highly correlated to a feeling of enjoyment that an activity generates. When Instant Enjoyment was controlled in the partial correlation analysis, the correlation coefficients between Total Interest and other sources declined drastically. The change in correlation strength implied that Instant Enjoyment might mediate the effects from other sources. Although Exploration Intention correlated with Total Interest similarly, its mediating effect was not detected in a partial correlation analysis where it was controlled.

Table 2. Correlation and partial correlation coefficients (controlled for Enjoyment) for gymnastics video data (N = 281) and basketball pass-shoot data (N = 191)

	Gymnastics Video					Basketball Pass-Shoot				
Correlation	*Interest*	*Attention*	*Challenge*	*Explore*	*Enjoy*	*Interest*	*Attention*	*Challenge*	*Explore*	*Enjoy*
Attention	.35**					.70**				
Challenge	.22**	.38**				.29**	.51**			
Exploration	.54**	.46**	.50**			.77**	.57**	.38**		
Enjoyment	.67**	.51**	.42**	.70**		.90**	.66**	.32**	.76**	
Novelty	.32**	.38**	.56**	.52**	.41**	.60**	.67**	.57**	.61**	.56**
Partial Correlation	*Interest*	*Attention*	*Challenge*	*Explore*		*Interest*	*Attention*	*Challenge*	*Explore*	
Attention	−.06					.31**				
Challenge	−.08	.26**				.00	.42**			
Exploration	.11	.14	.28**			.28**	.13	.22**		
Novelty	.14	.25**	.45**	.28**		.15*	.44**	.50**	.18**	

* p < .05, ** p < .01 (2-tailed)

Regression analysis

In the regression analysis, Total Interest was used as the dependent variable and the dimensional variables were used as predictors for both gymnastic stunts and pass-shoot data. Table 3 shows that Instant Enjoyment was the most influential source in the construct. It predicts 43% change (R^2 = .43) in Total Interest for gymnastics video task and 81% (R^2 = .81) for basketball pass-shoot task. Its standard coefficients also indicate this dominating effect on situational interest. The results from both regression and partial correlation analyses suggest a strong possibility that Instant Enjoyment might have mediated or suppressed the effects of other sources on situational interest. At this analytical step, it was reasonable to hypothesise that Instant Enjoyment might play a relatively independent role in the model.

Table 3. Regression of dimensional sources (predictors) on Total Interest (criterion) for gymnastics video data (N = 281) and basketball pass-shoot data (N = 191)

	B	β	t	*p*	$R^2_{adjusted}$
Gymnastics					.46
Enjoyment	.76	.62	9.72	.000	.43[a]
Novelty	.29	.23	3.20	.002	.02
Challenge	−.21	−.15	−2.25	.026	.02
Basketball					.84
Enjoyment	.67	.65	13.09	.000	.81[a]
Attention	.23	.21	4.93	.000	.02
Exploration	.18	.19	4.10	.000	.01
Challenge	−.10	−.10	−2.81	.005	.01

[a] R^2 change by the dimension as entered into the regression analysis

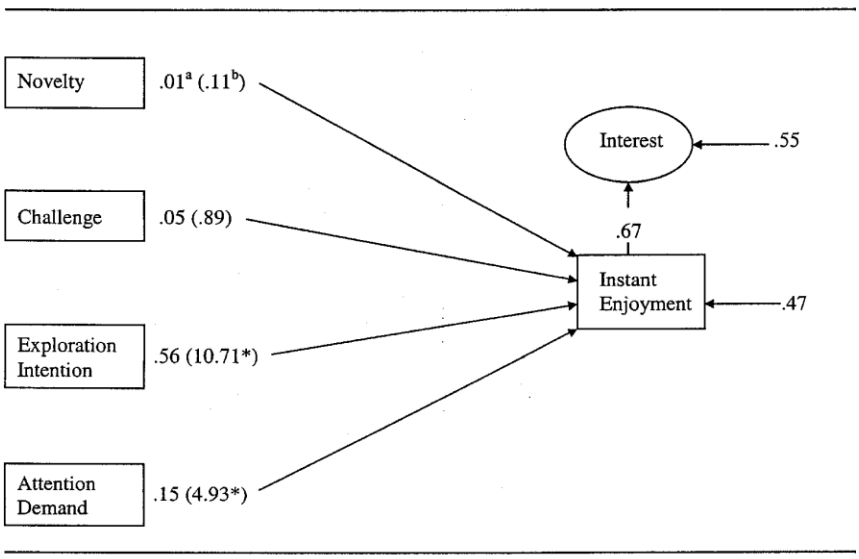
Path analysis

The analysis encompassed two path-modelling processes. First, the data from viewing gymnastic stunts were modelled in terms of the theoretical model that linked the five sources individually with Total Interest. This initial path model was then tested for its model-data fit. Adjustments were made according to the results from the correlation, partial correlation, regression, and goodness-of-fit analyses to derive a plausible alternative path model. Secondly, the alternative model was applied to the basketball pass-shoot data. In essence, this step replicated the first analysis to test whether the model could be used in interpreting situational interest in a different learning task. In the two path analyses, the scores on Total Interest served as the dependent (endogenous) variables representing the participants' overall evaluation of situational interest in the two activities. The scores on the five dimensions were used as independent (exogenous) variables.

First step analysis. In this step, the paths to be tested were selected exclusively on the basis of the initial empirical model (Chen *et al.*, 1999) shown in Figure 1. In this model, Instant Enjoyment had highest path coefficients (.59, *Z* estimate = 9.17, *p* = .01). Exploration Intention had significant (path coefficient = .17, *Z* = 2.52, *p* = .01) influence on Total Interest. Challenge, on the other hand, had a negative impact on Total Interest (path coefficient = — .15, *Z* = — 2.68, *p* = .01), suggesting that higher challenge may lead to less situational interest. The paths from Novelty (—.08) and Attention Demand (—.01) to Total Interest were not statistically significant (*Z* estimate = 1.46 and — .14 respectively; less than the threshold value of significance 2.0; *p* > .10). Because the model was saturated, the fitness of the model was perfect (χ^2 = 0. 00, *p* = 1.00), indicating that the model was meaningless (Jöreskog & Sörbom, 1993). The evidence suggested that adjustments in the model were needed.

According to the results from the partial correlation and regression analyses and those from the path analysis, a major adjustment was made in the model to designate Instant Enjoyment as a mediating factor. Figure 2 presents the model and its path coefficients after the mediating effect of Instant Enjoyment was adjusted. The significance test of individual paths revealed that paths from Challenge and Novelty to Instant Enjoyment were not statistically significant (*Z* estimate = .89, .11 respectively). In addition, the high path coefficient from Exploration Intention to Instant Enjoyment seemed to suggest another adjustment.

Figure 2. Model adjusted for Instant Enjoyment dimension

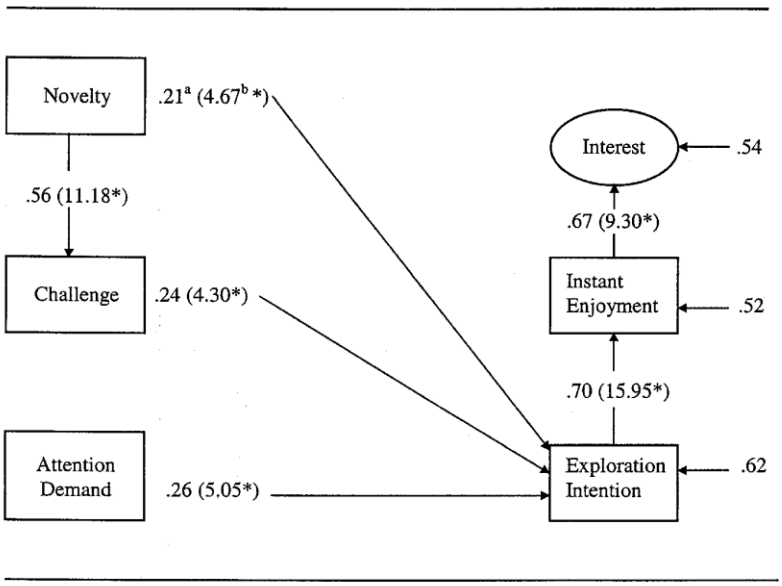


[a] Path coefficient, [b] *Z* estimate, * Statistically significant (*p* = .01)

Several adjustment attempts were made, during which the distinctive partial correlation coefficient between Novelty and Challenge was taken into account. Figure 3 describes a model adjusted to address these inter-dimensional relationships. In this model, all inter-dimensional paths were statistically significant. This model shows that Novelty may be a primary source of situational interest. However, its effect is not direct. Novelty functions to demand students' attention to the activity and represents challenge to them as well. Collectively,

these three preliminary dimensions arouse a desire to explore. When the exploration leads to a feeling of instant enjoyment in the person-activity interaction, situational interest results.

Figure 3. Model adjusted for Exploration Intention and Instant Enjoyment



[a] Path coefficient, [b] *Z* estimate, * Statistically significant (p = .01)

In addition to the theoretical articulation, an important indicator that guided re-specification of the models was the indices of goodness-of-fit tests for the models. Coupled with theoretical articulations, these indices show whether path models are valid in predicting the relationship in the future (Bollen & Long, 1993). The initial model was saturated in that all possible relationships from the independent variables (sources) to the dependent variable (Total Interest) were accounted for. In other words, the model had a zero degree of freedom. In such a saturated model, a perfect but meaningless fit is generated (Jöreskog & Sörbom, 1993). For the adjusted models reported in Table 4, even though the conventional indices of χ^2 were large for both, indicating a 'bad fit' (Jöreskog & Sörbom, 1993, p. 122), all other goodness-of-fit indices free of sample size influences were within or close to the range of acceptance. The Goodness-of-Fit Indices (GFI) for the two models were higher than the recommended .90 (Jöreskog & Sörbom, 1993). The Normed Fit Index (NFI), the Incremental Fit Index (IFI), the Comparative Fit Index (CFI) all exceeded .90, indicating a model-data fit for the two models (Bentler, 1990). The goodness-of-fit indices indicated that the two adjusted models (in Figure 2 and 3) could be considered valid. Thus, they were applied to the participatory data for further examination.

Table 4. Goodness-of-fit indices for adjusted path models

Index	Model in Fig. 2	Model in Fig. 3	Model in Fig. 4
Chi-square (χ^2)	12.92 (d.f.= 4, p= .01)	18.27 (d.f.= 7, p= .01)	77.42 (d.f.= 8, p= .00)
Goodness-of-Fit Index (GFI)	.99	.95	.91
Normed Fit Index (NFI)	.95	.87	.91
Comparative Fit Index (CFI)	.99	.94	.92
Incremental Fit Index (IFI)	.99	.94	.92
Root Mean Square Error of Approximation (RMSEA)	.09	.05	.02

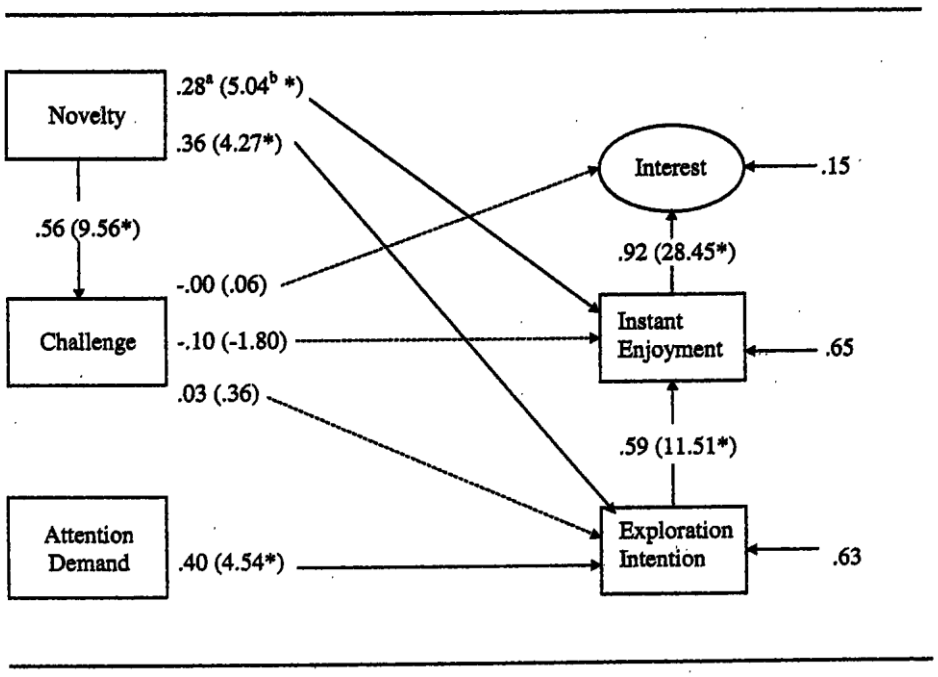
Second step analysis. The models that tested valid in the above step were imposed on the basketball pass-shoot data from the second sample (N = 191). After necessary adjustments, a path model was identified as theoretically interpretable and statistically sound. As presented in Figure 4, this model supported the previous ones by confirming that Instant Enjoyment was the most influential mediator. Exploration Intention was identified as a secondary mediator that influenced the effects from Novelty and Attention Demand on Instant Enjoyment. It is worth noting in this model that Challenge, in this participatory setting, became an isolated dimension. It had little significant effect on Total Interest, Instant Enjoyment, and Exploration Intention. In

addition, it absorbed the largest effect from Novelty. The examination of goodness-of-fit of this model, also reported in Table 4, indicates an acceptable fit.

Discussion

This study examined a theoretical model of situational interest. The analysed data support both hypotheses. For the first hypothesis, the correlation and regression analyses demonstrated differentiated associations between situational interest and the dimensional sources, novelty, challenge, exploration opportunities, instant enjoyment, and attention demand of a learning task (Chen *et al.*, 1999; Deci, 1992). Results of the path analyses supported the second hypothesis by identifying an inter-dimensional mediation effect in the model. Especially, the mediating effect of the Instant Enjoyment dimension on other sources became apparent in the analyses. The adjusted models (see Figures 2, 3, and 4) seem to suggest that instant enjoyment derives from novelty, exploration intention, and attention demand of an activity and, in turn, leads to situational interest. The relationship of instant enjoyment with other dimensions and situational interest strongly supports the notion that interest and enjoyment are a pair of separate but related motivators (Reeve, 1989). When delineating the relationship of the two within the construct of intrinsic motivation, Reeve speculated that interest and enjoyment complement each other to enhance intrinsic motivation. In this process, he suggested, situational interest occurs first and leads to a feeling of enjoyment.

Figure 4. Adjusted model using participatory data (basketball pass-shoot)



[a] Path coefficient, [b] *Z* estimate, * Statistically significant (p = .01)

Dash lines show non-significant/invalid paths from Challenge before adjustments

The adjusted models, however, challenge the relevance of this speculation. They show that instant enjoyment was a direct source of high situational interest and resulted from novelty, attention, and exploration features in the activities. In this sense, instant enjoyment is not a product from engagement in an activity but a process by itself during which a sense of becoming interested can be generated (Harackiewicz, Sansone, & Manderlink, 1985). As Kimiecik and Harris (1996) argued, enjoyment is an optimal experience in sports, exercise, and physical activity that leads a person to develop greater interest in an activity and motivates him/her to further pursue the activity. The data from this study suggest that students are able to perceive physical movement activities as interesting when the activity generates instant enjoyment during the person-activity interaction.

Situational interest is learning task specific. The differentiation of Model 3 (Figure 3) and 4 (Figure 4) suggests that the effects of dimensional sources on situational interest vary in terms of the nature of learning tasks.

Model 3 is based on a non-reading-based conceptual task (viewing videotaped activities) and Model 4 on a participatory task involving physical movement. Based on the tasks used as stimulus activities in this study, it seems that high situational interest relies upon instant enjoyment more directly. In addition, Novelty, Challenge, and Attention Demand had an equal effect on Exploration Intention in the conceptual task. In the physical task, however, the effect from Novelty was divided and the effect of Challenge diminished. These variations appear to suggest that in conceptual tasks challenge may contribute, although indirectly, to situational interest, while in physical tasks it may not contribute at all. Nor may it lead to a desire to explore or a sense of instant enjoyment.

Unexpectedly, Novelty did not have a direct effect on situational interest in both conceptual and physical learning tasks. It showed a high direct effect on Challenge, indicating that Novelty may trigger a strong feeling of being challenged. However, being challenged seemed to contribute little to situational interest and instant enjoyment in physical tasks. This result contradicts the findings from research in non-physical education settings. For example, researchers (Berlyne, 1971; Danner & Lonky, 1981; Harter, 1978) have observed that novelty and challenge tend to relate directly and positively to situational interest.

This inconsistency may be attributed to the fact that stimulus activities used in this study were physical activities, rather than cognitive tasks used in most other interest studies (Renninger *et al.*, 1992). It is likely that cognitive and physical challenges are perceived very differently by students, thereby having a different impact on their evaluation of situational interest. Thus, what can be observed in cognitive task engagement may not be observable in physical activity. Nevertheless, this issue itself may need further investigation.

The path models showed that both Novelty and Exploration Intention had positive effects that led students to experience instant enjoyment and eventually to feel interested in an activity. However, the magnitudes of their path coefficients to Instant Enjoyment indicate that characteristics that elicited students' exploration behaviour had higher potential than those of novelty did to generate instant enjoyment. The effect of Novelty was heavily mediated by Challenge. The results appear to imply that when introducing novel physical activities to students, teachers should keep challenge to a minimal level. To certain extent, providing new learning tasks can help increase a sense of enjoyment and enhance a feeling of interest. But such learning tasks may not be viewed as enjoyable and interesting when students perceive them as physical challenges. Taken together, these findings seem to suggest that, rather than merely providing a variety of different and new physical activities to students, physical education teachers should emphasise using exploration-oriented learning tasks to enhance students' feeling of instant enjoyment and situational interest in learning those activities.

The present study has provided preliminary evidence to support the theoretical model of situational interest and its sources in physical activity learning tasks (Deci, 1992; Renninger *et al.*, 1992). The analysed data revealed that high situational interest depends primarily upon instant enjoyment during a person-activity interaction. Other dimensional sources contribute indirectly to situational interest. An important finding in the study was that challenge contributes little to situational interest in physical activity learning tasks. Thus, caution must be taken when teachers attempt to motivate learners by challenging them with a new physical activity. In contrast, designing exploration oriented learning tasks can directly enhance instant enjoyment that leads to a high level of situational interest.

Given the fact that the theoretical model of situational interest and sources was tested on the basis of non-reading-based tasks, these findings should be interpreted carefully when applying them to reading-based classroom learning. Although the findings, especially the effect of enjoyment, are very consistent with correlational data from classroom research (Danner & Lonky, 1981; Frick, 1992; Schraw *et al.*, 1995), the verified models (i.e., models in Figure 3 and 4) still need to be tested and verified in other subject areas of learning. Until then, the full extent of validity of the model cannot be established.

The findings of this study have revealed several research questions that should be addressed in the future. In physical education, an immediate question is to examine what learning demands (e.g., cognitive, physical) in physical activity learning tasks enhance situational interest. In the general education arena, it seems necessary to

further test and verify the model delineating situational interest and its sources in other subject areas. Research on interest and its effects on learning in many subject areas (Renninger *et al.*, 1992) has shown that with students' self conception of competence, situational interest contributes significantly to students' intrinsic motivation. But these studies were conducted on theoretical bases specific to various subject-matter areas. Further validating this model will help clarify whether the construct of situational interest and its sources can be used across various subject-matter areas to motivate learners. Lastly, interest is but one factor in the teaching/ learning milieu that determines learners' motivation. Large-scale studies are needed to link situational interest and its sources to other motivation constructs such as self-efficacy, achievement goals, and self-determination for a better understanding of motivated learning. These studies may not only clarify various theoretical conceptions about motivation but also provide a consolidated theoretical spectrum that can be used in designing effective motivation strategies to promote learning.

Appendix 1
Items in the Situational Interest Scale

Exploration Intention
I want to analyse it to have a grasp on it.
I want to discover all the tricks in this activity.
I like to find out more about how to do it.
I like to inquire into details of how to do it.

Instant Enjoyment
It is an enjoyable activity to me.
This activity is exciting.
The activity inspires me to participate.
This activity is appealing to me.

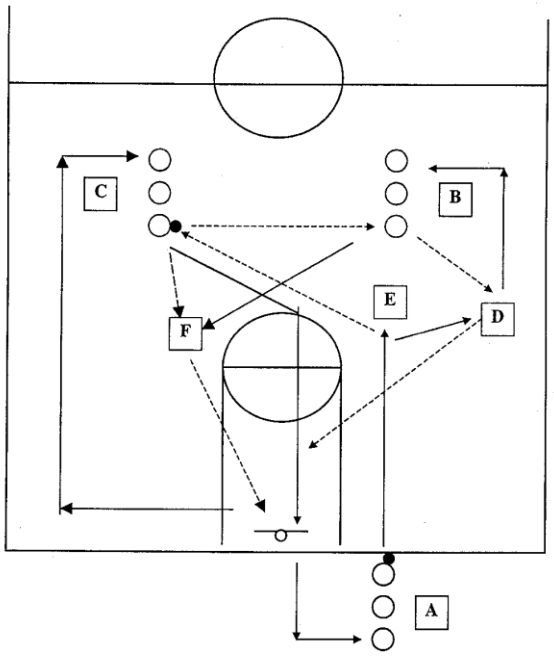
Novelty
This activity is new to me.
This activity is fresh.
This is a new-fashioned activity for me to do.
This is an exceptional activity.

Attention Demand
My attention was high.
I was very attentive all the time.
I was focused.
I was concentrated.

Challenge
It is a complex activity.
This activity is complicated.
This activity is a demanding task.
It is hard for me to do this activity.

Total Interest
This activity is interesting.
The activity looks fun to me.
It is fun for me to try this activity.
This is an interesting activity for me to do.

Appendix 2
Diagram of pass-shoot task



Pass-Shoot Task: C passes to B, same time A dribbles to E, passses to C, then moves to D; B passes to D then moves to F, C passes to F then starts cutting to basket; D passes to C for a lay-up then moves to end of B; C finishes lay-up, rebounds, then moves to end of A, F makes a jump shoot, rebounds, then moves to end of C.

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