



# Exploring situational interest sources in the French physical education context

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**Cédric Roure**

Interdisciplinary Research Group in Socialisation, Education and Training (GIRSEF),

Catholic University of Louvain, Belgium

**Denis Pasco**

School of Education, University of Bourgogne Franche-Comté, France

## Abstract

Based on the framework of interest, studies have shown that situational interest possesses strong motivation potential for students in physical education. Understanding how teachers can use situational interest in a classroom context is critical to motivate students. However, such investigations have been exclusively conducted in the United States and little is known about situational interest in other contexts. Grounded specifically in the French physical education curriculum, the purpose of this study was to investigate the relationships between the five situational interest sources (instant enjoyment, exploration intention, attention demand, challenge and novelty) and total interest, to demonstrate which sources could be related to total interest and to determine possible mediators' effects among sources. Students ( $n = 601$ ;  $M_{\text{age}} = 14.37$ ; range 11–18 years;  $SD = 1.96$ ; 51.4% boys) from 25 classes in six secondary schools participated in the study. They responded to the French situational interest scale after practising learning tasks in regular physical education lessons. On the basis of multiple-regression and mediation analyses, a structural equation model was formed to map out the meaningfulness of the relationships among situational interest sources and the total interest. Our results showed that instant enjoyment and exploration intention have direct and positive effects on total interest. In addition, these sources mediated the effects from attention demand and challenge toward the total interest. These results indicated that an effective way to motivate students in physical education is to build motivational components into the course content, especially those which enhance situational interest.

## Keywords

Situational interest, physical education, learning tasks, motivation

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## Corresponding author:

Cédric Roure, Faculté des Sciences de la Motricité, Université Catholique de Louvain, Place Pierre de Coubertin, 1–2, L8.10.01, 1348 Louvain-la-Neuve, Belgique.

Email: [cedric.roure@uclouvain.be](mailto:cedric.roure@uclouvain.be)

## Introduction

What makes participating in physical activity interesting? The answer depends in part on what one means by interest. According to Hidi (2006: 70), interest is defined as ‘a unique motivational variable, as well as a psychological state that occurs during interactions between persons and their objects of interest, and is characterized by increased attention, concentration and affect’. Research has shown that interest is a motivational variable that links the affective and cognitive components of motivation. The theory of interest, in an educational context, has been used to interpret students’ motivation in task engagement (Hidi and Renninger, 2006). In contrast with other motivational constructs that are centred on cognitive frameworks (e.g. achievement goal theory (Dweck and Leggett, 1988), self-efficacy theory (Bandura, 1997) and self-determination theory (Deci and Ryan, 1985)), interest has both an affective and a cognitive component. Affect is an essential part of interest’s conceptualization, which has led researchers to set interest apart from other motivational constructs (Renninger and Hidi, 2016). Although most investigations show that interest emerges from a person-environment interaction, researchers have demonstrated that individuals experience two forms of interest while participating in a physical activity: individual and situational (Chen et al., 2006). Individual interest refers to an individual’s psychological disposition, which guides their personal preferences toward particular activities. It is developed over time through a person’s constant and consistent interaction with certain activities in a particular environment (Renninger and Hidi, 2011). Even though physical education (PE) teachers recognize it as a powerful motivator, it is difficult to apply in their classroom context, principally because of its variable nature among students. Taking this into account, researchers tend to focus on situational interest (SI) as a major motivational variable (Chen and Ennis, 2008; Renninger and Hidi, 2011).

### *Situational interest in physical education*

SI is defined as ‘the appealing effect of the characteristics of an activity on individuals’ (Chen et al., 2006: 237). In contrast to individual interest, it is assumed that SI results from students’ recognition of the appealing features of a specific learning task, and so is transitory, environmentally activated and context-specific. Educational researchers consider that SI possesses stronger motivation potential than individual interest in daily teaching-learning settings, because teachers are able to enhance SI in learning tasks by manipulating their components. As SI is environmentally induced, educators can consciously design learning tasks that generate contextual stimuli, in order to effect a positive reaction to the learning process and task (Ding et al., 2013). SI has been conceptualized as a multidimensional construct, including five dimensions: novelty, challenge, attention demand, exploration intention and instant enjoyment (Chen et al., 2001). More specifically, Chen et al. (2014: 470) define these five dimensions as the following: (a) novelty refers to information deficiency between information known and unknown, (b) challenge is defined as the level of difficulty relative to one’s ability, (c) attention demand is the concentrated cognition and mental energy required in learning an activity, (d) exploration is conceptualized as the learning aspects that drive the learner to explore and discover, and (e) instant enjoyment refers to the characteristics that lead the learner to an instant positive feeling of being satisfied.

In addition to these dimensions, the SI construct also includes a ‘total interest’ element, which contributes to a student’s overall assessment of a task’s SI. As with the other dimensions, total interest is measured by the students’ answers to statements filled in on a scale. In concrete terms, students may be situationally interested when participating in a learning task if they perceive it as

new, challenging, demanding of particular attention and concentration, allowing them to explore the environment's possibilities and offering immediate enjoyment.

Since SI is associated with variables that teachers may have control over, such as task design, it could have stronger potential for motivating students to learn (Renninger and Bachrach, 2015). Accordingly, it has been demonstrated that high SI has positive effects on: (a) the development of students' knowledge in PE (Chen et al., 2006; Zhu et al., 2009); (b) their level of energy expenditure (Chen and Darst, 2002; Chen et al., 2006; Ding et al., 2013); (c) the pursuit of extra-curricular activities (Chen et al., 2014); and (d) the learning strategies they use in PE (Shen and Chen, 2006; Shen, Chen and Guan, 2007).

### *Differences between American and French PE contexts*

Previous research produced within the SI framework in PE was based on a United States (US) context, and consequently was conducted in line with the model of SI identified by Chen et al. (2001). This model can have four principal interpretations: (a) instant enjoyment is the major source of total interest as perceived by students; (b) instant enjoyment is identified as a mediator variable that influences the effects from exploration intention and novelty on total interest; (c) exploration intention mediates the effects from novelty and attention demand on instant enjoyment; and (d) challenge does not have any significant effect on other variables.

In conclusion, instant enjoyment was found to be a direct source of high SI and derived from novelty and exploration intention. According to Chen et al. (2001: 396): '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 [sic]'.

These results in general, and the model of SI in particular, have been identified through the lens and specificities of the PE context in the US. Given that no federal law defines the parameters of state PE programmes, the states and school districts usually allocate specific aims for PE content. Although it may be difficult to determine the PE content taught to students, due to the variable nature of the PE curriculum among states and school districts, the National Association for Sport and Physical Education (NASPE) developed a survey to collect nationwide PE programme information. Hence, researchers can use the NASPE's survey to clarify their understanding of PE programmes in the US, especially since Keating, et al. (2010: 181) argue that: 'Given the scope of the data set and NASPE's excellent reputation, it is reasonable to assume "The Shape of the Nation" is the best representation of PE policy available in the United States'. In accordance with the NASPE's survey, established in 2001 (the year the SI model was identified by Chen et al.), we can assume that PE teachers were encouraged to teach a variety of physical activities that promoted PE classes as fun and enjoyable. For this reason, and supported by data collected by Chen et al. (2001) on team sports, it is clear that instant enjoyment was found to be a direct and major source of SI, but as Chen et al. (2001: 398) wrote: 'it seems necessary to further test and verify the model delineating situational interest and its sources in other subject areas'. However, such investigations remain unexplored among other physical activities and little is known about the validity of the SI model in other PE contexts. Thus, the purpose of this study was to build a model of SI in the French PE context by examining the relationship between SI sources and total interest.

Chen and Ennis (1996) in the US and Pasco et al. (2012) in France have demonstrated the influence of value orientations on PE content and teachers' willingness to implement the curriculum. As PE curricula are historical products that are shaped by ever changing social, political,

cultural and educational forces, the cultural differences between the US and France might lead to differences in PE contexts. Differing from that of the US, the French PE context is characterized by a national curriculum, defining content and physical activities (Ministère de l'Éducation Nationale [French Ministry of Education] (MEN), 2010, 2015). National PE programmes are edited by the MEN and followed by teachers in their daily PE lessons. In line with these programmes, the ultimate aim of PE is to build an autonomous, culturally aware and balanced student by having them participate in a variety of physical activities. As PE is valued as an academic school subject and has to justify its position in the school curriculum (Collinet, 2006), students' cognitive engagement and intellectual development have been identified as two major aims. Furthermore, Pasco et al. (2008) confirmed this by examining French PE teachers' value orientations. They found that French PE teachers emphasize the values of disciplinary mastery and learning process, which means that they focus on developing performance proficiency in skills, understanding performance-related knowledge and learning how to learn the PE content. In other words, PE teachers help students to understand learning principles and how to apply them in the acquisition of new knowledge and skills. This strong cognitive tradition in the French PE context could have an impact on students' SI when they are involved in physical activities. In fact, this suggests that exploration intention might have a critical effect on students' SI.

Additionally, the French PE curriculum is defined by sports-centred activities, with an emphasis on their cultural meaning and skills development. This characteristic differentiates it from US PE, in so far as the American PE curriculum is more focused on developing an active lifestyle, taking into account the prevalence of childhood obesity. Basically, participating in sport-related activities is often associated with enjoyment in students' minds. In fact, when asking for students' opinions on PE lessons, Benhaim-Grosse (2007) indicates that almost three-quarters of the students reported that PE provided them with enjoyment and positive feelings. Under those circumstances, we expect instant enjoyment to be a major source of SI, as was demonstrated in the US PE context by Chen et al. (2001).

### *Purpose of the study*

In light of the differences between US and French PE, the aim of the present study was to build a model of SI based on the specificities of the French PE context. As Chen et al. (2001) argued that it was necessary to further test and verify the SI model in other contexts, it is relevant to investigate the relationship between SI sources and total interest in the French PE context. More precisely, this study aims to demonstrate which SI sources could be related to total interest, as well as determine possible mediators' effects among sources. Due to the limits observed in the study by Chen et al. (2001), which was principally the building of a model based only on basketball with middle school students, our study was conducted with middle and high school students who were participating in 14 different sport-related activities.

According to the specificity of the French PE context as shown by Collinet (2006), Pasco et al. (2008) and Benhaim-Grosse (2007), this study was based on two assumptions:

1. First and foremost, we hypothesized that instant enjoyment and exploration intention would relate positively to total interest, as perceived by students.
2. Then, we hypothesized that these two SI sources would mediate the effects from attention demand, challenge and novelty on total interest.

Overall though, we expected the French SI model to show direct effects from instant enjoyment and exploration intention, and indirect effects from the other three SI sources, on the total interest as perceived by students.

## Methods

### Participants

The present study sample consisted of 601 students ( $M_{\text{age}} = 14.37$ ; 11–18 years;  $SD = 1.96$ , 51.4% boys) from 25 PE classes, taken from six secondary schools located in the Northwest region of France. Students were in grade 6 (14.6%), 7 (16%), 8 (17.6%), 9 (16.9%), 10 (17.3%) or 11 (17.6%). Class sizes ranged from 16–37 students per class. They came from families living in districts of average and upper-average socioeconomic status. Permission to conduct the study was granted by the ethical board of the host university and agreement was also obtained from the principals of the participating schools. Students' parents were informed about the scope of the study and consent was requested: All parents allowed their children to participate in the study.

### Measures

*Situational interest.* The French 19-item SI Scale (Roure et al., 2016) was used to measure students' SI during learning tasks. The scale includes five SI sources: novelty (e.g. 'what we did today was new to me'), instant enjoyment (e.g. 'what we did was enjoyable for me'), exploration intention (e.g. 'I wanted to analyse and have a better handle on what we were learning today'), attention demand (e.g. 'what we were learning demanded my high attention') and challenge (e.g. 'what we were learning was hard for me to do'). Each of these five SI sources consists of three items. In addition to these 15 items, the total interest was also measured and it consists of four items. These 19 items were randomly arranged and each was rated on a five-point Likert scale ranging from 1 = 'strongly disagree' to 5 = 'strongly agree'. Roure et al. (2016) established the construct validity of the French SI Scale using exploratory and confirmatory factor analyses (goodness of fit index (GFI) = .93, normed fit index (NFI) = .93, comparative fit index (CFI) = .96 and root mean squared error of approximation (RMSEA) = .06). They also reported internal consistency (Cronbach's alpha) for novelty (.83), instant enjoyment (.84), exploration intention (.79), attention demand (.76), challenge (.77), and total interest (.85) among middle and high school students.

### Data collection

The teachers involved in this study were told to teach their lessons as usual. They were male and female full-time certified PE teachers, with teaching experience ranging from 7–20 years. Due to the large sample size of participants, data were collected on a variety of sport-related activities taught in the PE curriculum. These physical activities were dependent on the students' classes and grades:

- 6th grade: athletics, badminton, dance and kayaking;
- 7th grade: athletics, dance, handball and kayaking;
- 8th grade: athletics, badminton, basketball and baseball;
- 9th grade: badminton, climbing, gymnastics and orienteering;
- 10th grade: body-conditioning, swimming, volleyball and wrestling; and
- 11th grade: body-conditioning, gymnastics, orienteering and wrestling.

In this PE context, students participated in a physical activity unit consisting of seven to eight lessons. For the purpose of this study, the third or fourth lesson of the unit was chosen for collection of the data. In concrete terms, this was the lesson situated at the middle of the unit, for all physical activities. Immediately after completing the learning task set by the teachers in this lesson, students responded to the French SI scale (Roure et al., 2016). The students were asked to fill in the scale by thinking about the learning task completed. The data were collected by the researchers under the supervision of the students' own PE teacher. Researchers administered the questionnaire and collected it directly after completion. To minimize students' tendency to give socially desirable responses, the students were encouraged to answer honestly and assured that their responses would remain anonymous and confidential.

### **Data analyses**

The students' responses were aggregated respectively to the five sources of SI (instant enjoyment, exploration intention, attention demand, challenge and novelty) and to the total interest.

The statistical analyses were performed in the following steps. Preliminary analyses were conducted on study variables to examine normality, multicollinearity and internal reliability of the subscales. Pearson product-moment correlations and multiple regression were used to analyse the relationship between SI sources and total interest. The possible mediator or indirect effects between variables were examined using a bootstrap method with 5000 repetitions (Hayes and Scharkow, 2013). Finally, on the basis of the previous analyses, we formed a structural equation model, using AMOS software (Version 22, 2014), to map out the meaningfulness of the inter-relations among SI sources and total interest.

Maximum likelihood estimation was used to evaluate the fit of the hypothesized model to the empirical data. Acceptable model fit was assessed using multiple indices. The overall fit of the model to the data was examined via chi-square divided by the degree of freedom. A non-significant chi-square by degree of freedom indicates acceptable model fit (Blunch, 2008). RMSEA represents closeness of fit, with values approximating .06 and zero, demonstrating close and exact fit of the model (Hu and Bentler, 1999).

The CFI, the Tucker–Lewis index (TLI) and NFI test the proportionate improvement in fit, by comparing the hypothesized model (over identified model) with a just identified model. Acceptable model fit represents CFI, TLI, NFI values  $\geq .95$  (Hu and Bentler, 1999).

## **Results**

### **Preliminary analyses**

Analysis of the skewness (–.26 to .82) and kurtosis (–.88 to –.44) values revealed that the data were normally distributed. Multicollinearity was checked using the variance inflation factor (VIF) and tolerance statistics in SPSS Version 23 (2015). Neither VIF values  $> 10$  nor a tolerance value below .2 were found, indicating that there was no problem with multicollinearity between the variables. Mean substitution technique (Kline, 2010) was chosen to replace each missing score, due to their small number among the sample ( $< .01\%$ ). Internal consistencies were good, with Cronbach's alphas of .82 for total interest, .82 for instant enjoyment, .81 for exploration intention, .84 for attention demand, .79 for challenge and .88 for novelty, respectively. To examine whether the study variables differed according to student gender, belonging to the schools and classes, and physical activities, we conducted a multivariate analysis of variance with each of them as independent variables and with

the six study variables as dependent variables (the five SI sources and total interest). The multivariate effects of gender and schools were not significant, whereas the effects of classes (Wilks' Lambda = .55;  $F(5,595) = 2.59$ ;  $p < .001$  and  $\eta^2 = .08$ ) and physical activities (Wilks' Lambda = .66;  $F(5,595) = 3.26$ ;  $p < .001$  and  $\eta^2 = .10$ ) were significant. Univariate tests were significant for all study variables for classes' effects, and for all study variables except exploration intention for physical activities' effects. In light of these findings and due to the hierarchical nature of the data (i.e. student data nested in classes and schools), Kline (2010) recommends the use of multilevel analysis. Since the study variables did not differ significantly among schools, a two-level model would be appropriate (i.e. students at level 1 and classes at level 2). However, we proceeded with a single level model because the variance in each study variable attributed to the between-classes variability was normal given that SI is content-dependent, environmentally induced and strongly sensitive to learning tasks design. For this reason, we expected that analyses would yield differences in students' SI depending on classes and physical activities in so far as SI varies by definition. Nevertheless, we still analyzed the amount of variance explained by classes-level variance. Results showed that the intraclass correlation (ICC) for students' total interest was .065, meaning that between-classes variability accounted for 6.5% of the variance of students' total interest. Similarly, the ICC for the five SI sources ranged between .016 and .056, indicating a low between-classes variance. Under those circumstances and according to Preacher, Zhang and Zyphur (2011), multilevel analysis would have been less efficient as ICCs are lower than .10 for all study variables. Therefore, we proceeded with student level analysis in the primary analyses.

### Primary analyses

Means, SDs and correlations among the study variables are presented in Table 1. Our results showed that all variables were related to one another, except instant enjoyment and challenge. Additionally, instant enjoyment ( $r = .78$  and  $p < .01$ ) and exploration intention ( $r = .63$  and  $p < .01$ ) were strongly and positively related to total interest. Furthermore, challenge ( $r = .13$  and  $p < .01$ ) and novelty ( $r = .14$  and  $p < .01$ ) were the variables less related to total interest.

As in the procedure used by Chen et al. (2001), a series of multiple-regression analyses were conducted to examine whether SI sources could predict total interest. These analyses were performed as an 'a priori' approach, in order to determine the interrelations between SI sources and total interest. Regression analyses revealed that instant enjoyment ( $\beta = .63$ ;  $p < .01$ ) and exploration intention ( $\beta = .30$ ;  $p < .01$ ) were positive significant predictors of total interest, accounting for 69% of its variance.

As multiple correlations were demonstrated between these two dimensions and the other sources of SI, we tested multiple-regression analyses with instant enjoyment and exploration intention as dependent variables, and the other SI sources as independent variables. Results showed that exploration intention ( $\beta = .54$ ;  $p < .01$ ) and attention demand ( $\beta = .08$ ;  $p < .05$ ) positively predicted instant enjoyment, whereas challenge was a negative significant predictor ( $\beta = -.24$ ;  $p < .01$ ), and instant enjoyment ( $\beta = .46$ ;  $p < .01$ ), attention demand ( $\beta = .20$ ;  $p < .01$ ) and challenge ( $\beta = .20$ ;  $p < .01$ ) positively predicted exploration intention.

In line with previous analyses, we conducted two last multiple regressions with attention demand and challenge as the dependent variables and the other SI sources as independent variables. Results yielded that challenge ( $\beta = .41$ ;  $p < .01$ ) and novelty ( $\beta = .20$ ;  $p < .01$ ) were positive predictors of attention demand, while attention demand ( $\beta = .40$ ;  $p < .01$ ) and novelty ( $\beta = .24$ ;  $p < .01$ ) positively predicted challenge. All multiple-regression analyses are presented in Table 2.

**Table 1.** Descriptive statistics and correlations between study variables.

	Min	Max	Mean	SD	1	2	3	4	5	6
1. Total interest	4	20	12.94	3.77	–					
2. Challenge	3	15	7.68	3.10	.13 <sup>a</sup>	–				
3. Attention demand	3	15	10.11	3.12	.28 <sup>a</sup>	.48 <sup>a</sup>	–			
4. Instant enjoyment	3	15	9.91	3.24	.78 <sup>a</sup>	.02	.20 <sup>a</sup>	–		
5. Novelty	3	15	6.80	4.07	.14 <sup>a</sup>	.38 <sup>a</sup>	.36 <sup>a</sup>	.11 <sup>a</sup>	–	
6. Exploration intention	3	15	8.41	3.13	.63 <sup>a</sup>	.31 <sup>a</sup>	.41 <sup>a</sup>	.51 <sup>a</sup>	.26 <sup>a</sup>	–

<sup>a</sup> $p < .01$ .

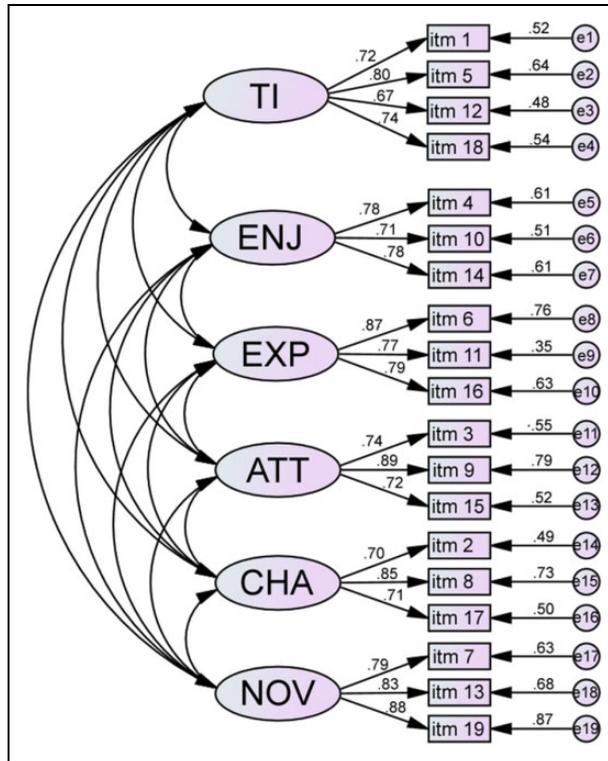
Max: maximum; Min: minimum.

**Table 2.** Series of multiple-regression analyses.

Predictor	$\beta$	$t$	Adjusted $R^2$
Total interest			.69 <sup>b</sup>
Challenge	.05	1.93	
Attention demand	.02	0.61	
Instant enjoyment	.63 <sup>b</sup>	23.36	
Novelty	-.03	-1.32	
Exploration intention	.30 <sup>b</sup>	10.27	
Instant enjoyment			.29 <sup>b</sup>
Challenge	-.24 <sup>b</sup>	-5.99	
Attention demand	.08 <sup>a</sup>	1.98	
Novelty	.04	1.04	
Exploration intention	.54 <sup>b</sup>	14.03	
Exploration intention			.39 <sup>b</sup>
Challenge	.20 <sup>b</sup>	5.27	
Attention demand	.20 <sup>b</sup>	5.35	
Novelty	.05	1.55	
Instant enjoyment	.46 <sup>b</sup>	14.03	
Attention demand			.27 <sup>b</sup>
Challenge	.41 <sup>b</sup>	10.79	
Novelty	.20 <sup>b</sup>	5.37	
Challenge			.28 <sup>b</sup>
Novelty	.24 <sup>b</sup>	6.40	
Attention demand	.40 <sup>b</sup>	10.79	

<sup>a</sup> $p < .05$ .<sup>b</sup> $p < .01$ . $\beta$ : Standardized beta coefficient;  $t$ : test value.

Findings from the series of multiple-regression analyses indicated that instant enjoyment and exploration intention had direct effects on total interest, and they represented possible mediator variables for the effects from attention demand, challenge and novelty on total interest. Moreover, challenge and attention demand could presumably have mediated the effects from novelty on instant enjoyment and exploration intention. In order to examine the multiple mediation effects among the study variables, we used a bootstrap method with 5000



**Figure 1.** Measurement model of situational interest. ATT: attention demand; CHA: challenge; ENJ: instant enjoyment; EXP: exploration intention; NOV: novelty; TI: total interest.

repetitions (Hayes and Scharkow, 2013). Results from these analyses were taken into account to build a structural regression (SR) model (Kline, 2010) of students’ SI in the French PE context. According to Kline (2010), a SR model is the synthesis of a structural model and a measurement model. Unlike path analysis models, a SR model allows researchers to test hypotheses about direct and indirect effects with latent variables, because it ‘incorporates a measurement component that represents observed variables as indicators of underlying factors, just as in confirmatory factor analysis (CFA)’ (Kline, 2010: 118). This implies that the specification and identification of a SR model need a valid measurement model before it makes sense to evaluate the structural part of the model.

As our latent variables have three indicators (except for total interest), we used a two-step testing method for the SR model (Kline, 2010). In the first step, the SR model is specified as a CFA measurement model that is analysed in order to determine whether it fits the data. Given an acceptable measurement model, the second step is to analyse the structural part of the model and to compare if it fits with near different structural models.

The measurement model of all six latent constructs and 19 indicators, depicted in Figure 1 (five SI sources and total interest) yielded a good fit to the data ( $\chi^2(115) = 317.39$ ;  $\chi^2/df = 2.76$ ; CFI = .97; NFI = .95; TLI = .95; RMSEA = .054 with CI<sub>90</sub> = .047–.061). The factor loadings of the indicators ranged between .67 and .89. Table 3 lists the 19 items of the French SI scale.

**Table 3.** List of items of the French 19-items situational interest scale.

	Factor
Total interest	
1. <i>Ce que nous avons appris était passionnant</i> [What we were learning today looks fun to me]	.72
5. <i>Ce que nous avons appris était intéressant à faire pour moi</i> [What we were learning was interesting for me to do]	.80
12. <i>Ce que nous avons appris était attrayant pour moi</i> [What we were learning attracted me (to participate)]	.67
18. <i>Ce que nous avons appris était intéressant</i> [What we were learning was interesting]	.74
Instant enjoyment	
4. <i>Ce que nous avons appris m'a semblé amusant</i> [What we were learning was appealing/amusing to me]	.78
10. <i>C'était amusant pour moi d'essayer ce que nous avons appris</i> [What we were learning inspires me to try out what we were learning]	.71
14. <i>Ce que nous avons fait était agréable pour moi</i> [What we did was enjoyable for me]	.78
Exploration intention	
6. <i>J'aimerais en savoir plus sur comment faire ce que nous avons appris aujourd'hui</i> [I wanted to know more about how to do what we were learning today]	.87
11. <i>J'ai cherché à analyser et à mieux saisir ce que nous avons appris aujourd'hui</i> [I wanted to analyze and have a better handle on what we were learning today]	.77
16. <i>J'aimerais en connaître plus sur comment faire ce que nous avons appris</i> [I'd like to know more about how to do what we were learning]	.79
Attention demand	
3. <i>Ce que nous avons appris m'a demandé beaucoup d'attention</i> [What we were learning demanded my high attention]	.74
9. <i>Ce que nous avons appris aujourd'hui m'a demandé de l'attention</i> [I was focused on what we were learning today]	.89
15. <i>Ce que nous avons appris a exigé de la concentration</i> [I was concentrated on what we were learning]	.72
Challenge	
2. <i>Ce que nous avons appris était complexe</i> [What we were learning was complex]	.70
8. <i>Ce que nous avons appris était compliqué</i> [What we were learning was complicated]	.85
17. <i>Ce que nous avons appris était difficile à faire pour moi</i> [What we were learning was hard for me to do]	.71
Novelty	
7. <i>Ce que nous avons appris était une activité nouvelle que je fais pour la première fois</i> [What we were learning was a new activity for me to do, which I did for the first time]	.79
13. <i>Ce que nous avons fait aujourd'hui était nouveau</i> [What we did today was fresh/new]	.83
19. <i>Ce que nous avons fait aujourd'hui était nouveau pour moi</i> [What we did today was new to me]	.88

Results from CFA analyses allowed us to test the structural part of the model. In light of the findings from the series of multiple-regression and mediation analyses among the study variables, and from the model previously established by Chen et al. (2001), we tested a first structural model, specifying the paths from novelty via attention demand and challenge towards total interest and from novelty via exploration intention and instant enjoyment towards total interest. Reciprocal paths were drawn between attention demand and challenge and between exploration intention and instant enjoyment. Furthermore, cross-paths were tested from attention demand towards instant enjoyment and from challenge towards exploration intention. Results from this model yield an acceptable fit to the data ( $\chi^2(122) = 329.34$ ;  $\chi^2/df = 2.70$ ; CFI = .96;

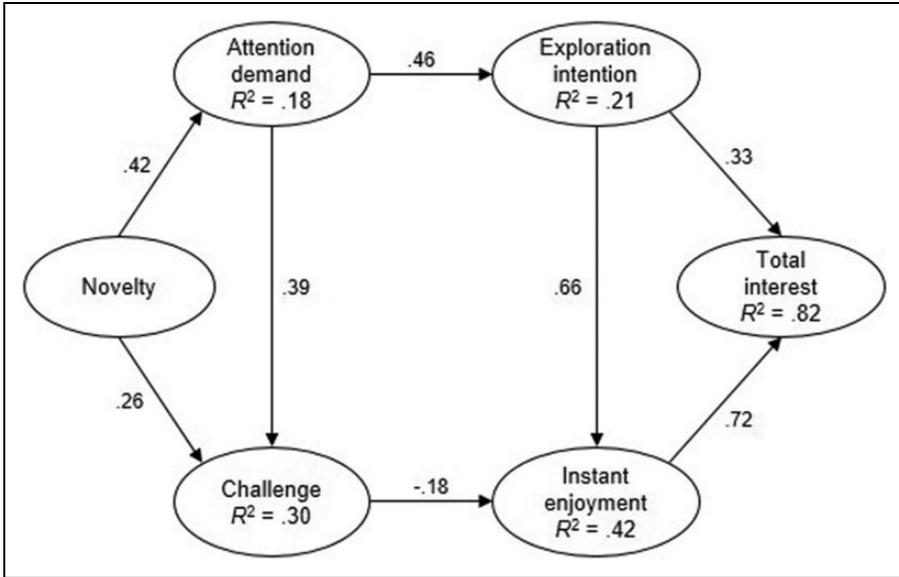


Figure 2. Graphical representation of the structural model of situational interest.

Table 4. Indirect effects among study variables.

IV	MV	OV	IE	CI <sub>95</sub>
Novelty	Attention demand	Challenge	.16	(.03-.28)
	Attention demand	Exploration intention	.19	(.05-.29)
	Challenge	Instant enjoyment	-.05	(-.11-.07)
Attention demand	Challenge	Instant enjoyment	-.07	(-.10-.04)
	Exploration intention	Instant enjoyment	.30	(.17-.40)
	Exploration intention	Total interest	.32	(.18-.41)
Challenge	Instant enjoyment	Total interest	-.13	(-.21-.05)
Exploration intention	Instant enjoyment	Total interest	.47	(.35-.59)

IE: indirect effect; IV: independent variable; MV: mediated variable; OV: outcome variable.

NFI = .95; TLI = .95; RMSEA = .053 with CI<sub>90</sub> = .046-.06). However, the direct paths from challenge towards attention demand and from instant enjoyment towards exploration intention were not significant. As a result, we tested a second structural model removing these two paths, which led to a better fit ( $\chi^2(124) = 331.54$ ;  $\chi^2/df = 2.67$ ; CFI = .97; NFI = .95; TLI = .95; RMSEA = .053 with CI<sub>90</sub> = .046-.06), but with another two non-significant direct paths resulting from challenge toward exploration intention and from attention demand toward instant enjoyment.

Finally, we removed these two non-significant direct paths, to draw a third structural model, which yielded a good fit to the data ( $\chi^2(126) = 314.71$ ;  $\chi^2/df = 2.50$ ; CFI = .97; NFI = .95; TLI = .96; RMSEA = .05 with CI<sub>90</sub> = .043-.057). This model is displayed graphically in Figure 2 and the indirect effects among study variables are reported in Table 4.

Focusing on the effects of SI sources on total interest, there were two statistically significant direct paths from instant enjoyment ( $\beta = .72; p < .001$ ) and exploration intention ( $\beta = .33; p < .001$ ) to total interest. In addition to its direct effect on total interest, exploration intention also has an indirect effect on this variable, mediated by instant enjoyment. Indirect effects were observed from attention demand and challenge toward total interest, mediated by exploration intention and instant enjoyment, respectively. Lastly, novelty has direct effects on challenge and attention demand, and has indirect effects on exploration intention via attention demand, and on instant enjoyment mediated by challenge.

## Discussion

The purpose of this study was to build a model of SI grounded specifically in the French PE context. Based on interest theory, we investigated the relationship between the five SI sources (instant enjoyment, exploration intention, attention demand, challenge and novelty) and total interest, to demonstrate which SI sources could be related to total interest and to determine possible mediators' effects among sources. According to this specific PE context, we made two assumptions.

- Instant enjoyment and exploration intention would relate positively to total interest as perceived by students.
- These two SI sources would mediate the effects from attention demand, challenge and novelty on total interest.

Consistent with the first assumption, our model of SI demonstrated the direct and positive effects of instant enjoyment and exploration intention on total interest. In line with Chen et al. (2001), our findings suggested that instant enjoyment and total interest are strongly associated in PE. It seemed that students perceived high situational interest when they found learning tasks fun and enjoyable. This result confirms findings from Behaim-Grosse (2007) indicating that almost three-quarters of the students reported that PE provided them with enjoyment and positive feelings. Besides this, a strong association between interest and enjoyment is well-established in many other subject areas (Ainley and Hidi, 2014). For example, Pinquart and Sorensen (2009) demonstrated positive relations between enjoyment and interest when people were in familiar contexts, that is to say, when a learning task is not new. In our case, students participated in familiar learning tasks, as teachers were told to teach as usual.

Based on theorizing and recent studies in the field of interest (Ainley and Hidi, 2014), there is substantial evidence for a strong positive link between students' reports of interest and enjoyment, especially when the situation occurs in a well-known environment. In summary, 'interest and enjoyment may be complementary and reciprocal components of the experience when an individual is pursuing an idea, exploring and seeking new information, or creating a novel solution to a problem' (Ainley and Hidi, 2014: 207).

Although our findings are relevant to the general field of interest theory, the critical role of enjoyment on SI can be explained by the fact that enjoyment is seen as the most important affective consequence of quality PE (Cairney et al., 2012). Generally defined in PE as a positive affect that reflects feelings such as pleasure, liking and fun, enjoyment has been theoretically articulated as a multi-dimensional construct (Hashim et al., 2008). Among the dimensions, the highest correlation was obtained between activity-generated excitement and PE enjoyment, assuming that activity-generated excitement relates to activities that lead students to perceive enthusiasm, excitement and

interest in PE. 'This finding reinforces the importance of providing exciting and stimulating activities for students in school-based PE programmes' (Hashim et al., 2008: 192). Obviously, instant enjoyment can be viewed as a powerful source of motivation for students, as it has direct and strong effects on total interest. Given these points, many studies have considered that enjoyment represents a key factor underlying the motivation for students to maintain positive engagement in PE (Grasten et al., 2012; Yli-Piipari et al., 2009).

Our results showed that exploration intention also had a direct effect on total interest. The prevalence of exploration intention in the French PE curriculum is supported by the fact that the learning tasks are often cognitively driven and based on students' reactions to the environment. Basically, it is related to the value orientations of French PE teachers, which are centred on disciplinary mastery and learning process (Pasco et al., 2008). Since PE teachers are focused on understanding performance-related knowledge and learning how to learn the content of PE, they encourage students' exploration intention related to the stimuli present in the environment. This emphasis on students' exploration intention leads to an increase in total interest. In essence, our results are congruent with those obtained in other subject areas such as the sciences, where Rotgans and Schmidt (2011) found that SI was immediately heightened after a problem-solving presentation to polytechnic students. Similarly, in response to scientific problems with middle-school students, Ainley and Ainley (2011) demonstrated positive relationships between interest, the desire to find out more about a specific topic and feelings of enjoyment. As in the science domain, French PE teachers encourage students to make choices based on their interpretation of the task, encouraging problem-solving and decision-making within the learning tasks. Consequently, the relationship between exploration intention and total interest is well-founded, as providing the students with the opportunity to make choices in the learning environment has repeatedly been associated with situational interest and intrinsic motivation (Hogheim and Reber, 2015; Patall, 2013). All things considered, our findings are relevant because instant enjoyment and exploration intention have direct effects on total interest and can promote an increase in students' motivation for learning tasks.

In addition to the direct effects observed between instant enjoyment, exploration intention and total interest, our results confirmed the second assumption by showing the indirect effects of challenge and attention demand on total interest. More precisely, the model of SI indicated two different pathways: (a) indirect effects from challenge toward total interest mediated by instant enjoyment; and (b) indirect effects from attention demand toward total interest mediated by exploration intention.

Since challenge is defined as the level of difficulty relative to one's ability, interpretations of the relationship between challenge and instant enjoyment have to be made in light of the students' perceptions of ability or competence. According to Fairclough (2003), children experience enjoyment and motivation when a task they are involved in is comparable to their level of perceived ability. In the same vein, the findings suggested that perceived competence may be an important factor affecting students' enjoyment of their experiences in PE. As found in a previous study, children who had higher perceived competence levels reported increased levels of enjoyment in PE (Cairney et al., 2012). Taking this finding into account, the negative relationship between challenge and instant enjoyment has to be interpreted as the need to find an optimal challenge in learning tasks, to promote students' instant enjoyment. Being able to perform a task to a self-perceived level of success influences the enjoyment of that task. Consistent with this reasoning, when students believe their ability and actual success to be below what they perceive as the teachers' and peers' expectations, then

their enjoyment of the activity decreases. Additionally, students who perceive the task to be too easy and not personally challenging feel that enjoyment is also diminished. In conclusion, the results emphasize the importance of students' perceived ability of a presented task, whether it is too difficult or too easy, in relation to their perceived enjoyment (Smith and Saint-Pierre, 2009).

The second pathway, as illustrated in Figure 1, indicated the indirect effects from attention demand toward total interest, mediated by exploration intention. As attention demand is defined as the concentrated cognition and mental energy required in learning an activity, the mental models elaborated by students could explain its relationship with exploration intention. In that case, attention demand has to be viewed as a cognitive demand necessary to elaborate mental thoughts about the environment. According to Pasco and Ennis (2015a, 2015b), learning in PE could come from changes in students' conceptual understanding, which means that students' learning depends on their cognitive involvement. As found in their study, students' mental models are related to the intention to discover and explore the learning environment. For this reason, the association between attention demand and exploration intention appears to be well founded. Indeed, students who are exploring and discovering their environment need to build a mental representation of it, to make relevant decisions and choices leading to successful learning. The final point, as supported by our model of SI, is the particular position of novelty. This result is quite similar to that of Chen et al. (2001), which means that novelty has only low indirect effects on total interest as perceived by students. Compared to studies of the interest's framework, this result is not congruent in so far as novelty is often identified as a critical variable for students' SI (Ainley and Hidi, 2014; Palmer, 2009). However, these low indirect effects from novelty toward total interest can be explained by the fact that teachers were told to teach PE lessons as usual and also by students' perceptions of physical activities as commonly used in the French PE context.

## Conclusions

### *Practical implications*

The findings of the present study may have significant implications for teachers in PE. Consistent with many studies of the interest's framework, SI possesses strong motivation potential, because by manipulating its sources, teachers may be able to enhance SI in learning tasks. The most effective way to motivate students is to build motivational components into the course content, especially those which enhance SI.

According to the model of SI built in the French PE context, instant enjoyment and exploration intention appear to be two major motivating sources. This finding reinforced the importance for teachers to create exciting and stimulating activities for students. In line with the strong and direct positive effect of instant enjoyment on total interest, PE teachers have to promote positive feelings and fun when students are engaged in physical activities. As exploration intention has a direct effect on total interest and an indirect effect on it was mediated by instant enjoyment, we can assume that motivating students in PE demands more than fun. This suggested that teachers might design tasks that require not only physical engagement and enjoyment, but also higher-order cognitive processes demanding active exploration. For this reason and on the basis of a recent study (Jaakkola et al., 2015), teachers might give students more autonomy by involving them in decision-making. This will give them the freedom to make choices and the opportunities to affect

the way learning tasks are carried out. To support this autonomy, exploration intention can be enhanced when designing tasks which will have a positive effect on instant enjoyment. To conclude, designing exploration-oriented situations could be associated with instant enjoyment, which may result in a high level of SI. Taken together, instant enjoyment and exploration intention could lead to better involvement of students in learning tasks.

In terms of the implications for school teaching practice, the model of SI can help PE teachers to understand better how SI sources are indirectly related to total interest. From this perspective, the relationships between instant enjoyment and challenge, and between exploration intention and attention demand, should be clear to teachers. Firstly, the negative relationship between challenge and instant enjoyment can be interpreted as the need to find an optimal challenge in learning tasks, to promote instant enjoyment. Simultaneously, to enhance this enjoyment, teachers need to pay attention to students' perceived ability of a presented task (Smith and Saint-Pierre, 2009). They should create learning tasks that are optimally challenging, which in turn can contribute to maintaining the students' perceived ability. These tasks should be differentiated by providing multiple levels of difficulty and several possibilities for the students' progression. Secondly, PE teachers could encourage an increase in attention demand, by designing cognitive tasks that lead students to create mental representations about their environment. Enhancing students' mental representations would facilitate their willingness to explore. Consequently, learning tasks could be presented as problem-solving (Ainley and Ainley, 2011; Rotgans and Schmidt, 2011).

### *Limitations and future studies*

The findings of the present study should be interpreted with caution, due to two major limitations. The first limitation pertains to the cross-sectional design of the study, which prevents drawing any conclusions about causal relationships between the variables. The interplay of factors could only be assessed by using longitudinal and/or experimental approaches. Due to this limitation, future studies can aim at experimentally manipulating learning tasks components or longitudinally investigating whether changes in learning tasks lead to changes in students' SI. This will lead to gaining of further insight into the directionality of the proposed relationships.

The second limitation lies in the practical implications derived from our model, especially the understanding of the five SI sources. To a certain extent, the findings of this study provide five potential possibilities for PE teachers to design learning tasks to enhance students' motivation. However, we can assume that teachers might choose one or two of the SI sources, instead of incorporating all five to develop an interest in learning tasks. Thus, future studies should explore which sources have to be associated, in order to design situationally interesting tasks for students. Empirical studies are needed to better understand the effects of learning task design on students' SI in a variety of physical activities.

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### Author biographies

**Cédric Roure** is an Associate Professor at the Faculty of Motor Sciences in the Catholic University of Louvain (UCL), Louvain-la-Neuve, Belgium. He is a member of the Interdisciplinary Research Group in Socialisation, Education and Training (GIRSEF).

**Denis Pasco** is a Professor at the School of Education in the University of Bourgogne Franche-Comté (UBFC), Besançon, France. He is a Researcher at the ELLIAD research lab.