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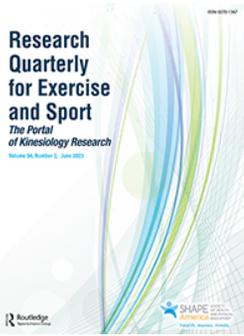
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Matching Learning Tasks With Students' Conative Stages in Badminton: Effects on Situational Interest

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ABSTRACT

Purpose: The purpose of this study was to determine the extent to which matching three learning tasks with students' conative stages in badminton can increase their situational interest. **Method:** Ninety-seven secondary school students ($M_{age} = 13.0$, $SD = 1.4$, 50.5% girls, aged 11–16) practiced three learning tasks in badminton, designed to reflect the game intentions associated with their conative stages. They responded to the 15-item situational interest scale after practicing each of the three learning tasks. **Results:** According to the differences related to the SI dimensions scores between the learning tasks, matching the design of three learning tasks with the students' game intentions results in higher scores in the SI dimensions. **Conclusion:** Using the conative stages to characterize students' expertise levels in badminton, this study fine-tunes the connection between the students and the learning tasks by exceeding the common criterion related to the students' technical skills. This study also confirms that instant enjoyment, exploration intention, attention demand, and challenge were key dimensions underlying students' motivation in badminton in relation to its technical, tactical and physical components.

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Motivation; physical education; secondary school

Contemporary approaches define interest as a motivational variable that directs students' attention to specific objects and stimuli, and guides their engagement toward specific activities (Renninger & Hidi, 2016). Researchers make a difference between the psychological state of interest and the stable trait of interest (Harackiewicz & Knogler, 2017). As a psychological state, situational interest (SI) is characterized by increased attention, concentration, and affect experienced in a particular moment. In contrast, individual interest is considered a stable trait and is related to an enduring predisposition to reengage with a particular content over time (Hidi, 2006). In physical education (PE), systematic research on interest has mainly investigated SI and evidence has been accumulated on its motivational functions. Positive effects of SI have been demonstrated on students' knowledge (e.g., Zhu et al., 2009), students' energy expenditure (e.g., Ding et al., 2013), and students' learning strategies (e.g., Roure, Kermarrec, & Pasco, 2019). Furthermore, various factors have been identified to elicit students' SI such as the use of video feedback augmented by teachers' feedback (Roure, Méard et al., 2019), learning task design (e.g., Roure & Pasco, 2018) and, specific characteristics of PE contexts (e.g., Lentillon-Kaestner & Roure, 2019; Roure, Lentillon-Kaestner et al., 2019). This centration on SI can be explained as SI possesses stronger motivational potential than individual interest in daily teaching-learning settings, because teachers can enhance SI in learning tasks by manipulating its components (Roure & Pasco, 2018).

Designing learning tasks to elicit students' situational interest in badminton

Since researchers have argued for the need for further investigation into the role of SI dimensions in motivating students (Sun et al., 2008), Roure and Pasco (2018) have studied the impact of two learning tasks in badminton on the SI perceived by 167 middle-school students ($M_{age} = 13.21$, $SD = 2.24$, 59% boys, aged 12–16). In their study, SI was conceptualized as multidimensional, encompassing five dimensions: novelty, challenge, attention demand, exploration intention, and instant enjoyment. In concrete terms, students were situationally interested when participating in the learning tasks, if they perceived these tasks as new, challenging, and demanding particular attention or concentration, allowing them to explore and discover the environment's possibilities or by offering immediate enjoyment. More precisely, the learning tasks were designed to promote SI either through instant enjoyment and exploration intention or through challenge and novelty. The students practiced both tasks and responded to the French SI scale measuring the five SI dimensions (Roure et al., 2016).

The results from a variable-centered analysis (i.e., a repeated measures MANOVA) revealed that the students were sensitive to the SI dimensions on which each task was designed, as they reported significantly different scores for the four SI dimensions between both learning tasks. In addition to the variable-centered analysis, Roure and Pasco (2018) conducted a further person-centered analysis (i.e., a cluster analysis) to take into account the students' interpersonal

differences. Although most of the students were sensitive to the design process, this analysis revealed interpersonal differences. Three profiles emerged from the results: a low design receptive profile with low scores on all SI dimensions (24% of total students), a design receptive profile with high scores on the SI dimensions on which each task was designed (38% of total students), and a high SI profile with high scores on all SI dimensions (38% of total students). In the light of Roure and Pasco's (2018) results, it shows that students' receptiveness to the learning tasks is dependent on how they interact with their environment. As it was demonstrated that SI emerged from the interaction between a student and their environment (Renninger & Hidi, 2016), learning task design should take into account both the environment and the students' characteristics. This is particularly in line with the theoretical model of the Constraint Led Approach (CLA) to skill acquisition and game play (Renshaw et al., 2010). Adopting a CLA drives educators and teachers to consider learners as complex and adaptive dynamic systems. The learners' engagement within learning tasks is considered as an emergent phenomenon resulting from the interactions between three categories of constraints: (a) the organism (individual's personal characteristics), (b) the environment (external physical and social characteristics), and (c) the task (specific goals of an activity). Under this perspective, Roure and Pasco's (2018) study showed that a well-constructed design process in badminton can manage the environmental and task constraints, but is insufficient to manage the organism constraint related to the differences between students, particularly in terms of expertise levels. By identifying three different students' profiles related to their receptiveness to the learning tasks, further improvement is needed when designing learning tasks which are based on students' expertise levels. In sum, there is some evidence that teachers might wish to exploit the link between student expertise levels and learning tasks if an increase SI levels is targeted.

Using students' conative stages in badminton to characterize students' levels of expertise

In contrast with traditional expertise classification in the field of sports and motor learning: Fitts and Posner's (1967) cognitive, associate and autonomous stages of learning; Gentile's (1972) fixation and diversification stages of learning, the conative framework hypothesizes that players' improvement in an activity is not solely a matter of greater efficacy but it also relies on a change in their conative domain, which in turn means a shift in the players' game intention (Bui-Xuân & Récopé, 2006). The game intention corresponds to a player's perception of their environment and a particular relationship between the player and the activity, which can be observed by a player's preferential register of action.

Depending on their level of experience (i.e., "conative stage"), the players' game intentions derived from a combination of three game components: physical, tactical, and technical. The physical component refers to basic motor skills (e.g., the ability to run and jump); the tactical component corresponds to decision-making skills (e.g., choices, strategies); whilst the technical component refers to specific motor skills

(e.g., smash, drop, clear, in badminton). Within the conative framework, these three components are combined to characterize a player's game intention explaining the choices the students make when they play.

Five conative stages are proposed for the classification of student expertise levels, from novice to expert: (1) structural, (2) functional, (3) technical, (4) contextual, and (5) expertise. All these stages are characterized by a combination of the aforementioned components (physical, tactical, and technical), but in each stage one of the components dominates the other. This conative classification has been applied to classify students in athletic activity (Vanhelst et al., 2012) and more recently in badminton (Dieu, Llena et al., 2020; Dieu, Schnitzler et al., 2020; Dieu et al., 2014).

In badminton, the players in the structural stage intend to reach and strike the shuttlecock toward the opponent's side and avoid letting it fall on their own side. This intention relies predominantly on the physical component of the game. Concretely, students use basic motor skills to reach a maximum of shuttlecocks and return them one more time than their opponent. Once the players have solved the problem of returning the shuttlecock, they begin to play by seeking free space to move the opponent. This intention corresponds to the players in the functional stage. Even if their technical skills are still at a basic level, they place the shuttlecocks in locations away from the opponent, which explain why the tactical component of the game is predominant. On the technical stage, the players intend to make a winning stroke by using specific motor skills dedicated to badminton, explaining the centration on the technical component of the game. More concretely, they often use a specific offensive shot (smash or dropshot) to shorten and finish the point. In the contextual stage, the players develop more the relationship between the technical and tactical components of the game. Their intention is to develop a tactical sequence during the game. They integrate their technical skills from a tactical perspective, which means that they can build a sequence of different strokes. In concrete terms, they combine offensive and defensive skills, to produce shuttlecocks' trajectories which time-pressure their opponent. Finally, the expert stage is characterized by an optimal game physical, tactical and technical components. The intention of the students is to mobilize their own tactics and techniques according to their personal style of play. The details of the five conative stages in badminton and the classifying indicators are presented in Table 1.

Purpose and relevance of the study

The purpose of this study was to determine the extent to which matching three learning tasks to students' conative stages in badminton can increase their SI. This study is relevant since the learning tasks are designed to be adapted to the students' game intentions using their conative stages in badminton. Unlike Roure and Pasco's (2018) study, which used the SI dimensions to design learning tasks for students, this study referred to matching the students' conative stages to specific learning tasks in order to increase

Table 1. Students' conative stages and classification indicators for badminton players according to Dieu, Schnitzler et al. (2020).

Conative stage	Students' game intention- Priority component	Behavior description	Classifying indicators (physical, tactical and technical components)
Stage 1 Structural	Returning the shuttlecock- Physical	The player returns the shuttlecock to the other side of the net regardless of where it lands. The shuttlecock is seen as an obstacle	The rallies are long (7 or more hits). The shuttlecock trajectories are predominantly in the central axis. Players make more unforced errors compared to forced errors. The players' overhead forehand strokes are based on elbow flexion without any trunk action
Stage 2 Functional	Placing the shuttlecock- Tactical	The player hits the shuttlecock with various trajectories, seeking free space, to move their opponent	The rallies are short (3–4 hits). The shuttlecock trajectories vary using either the width of the court or its depth. Players make more forced errors compared to unforced errors. The players' overhead forehand strokes are based on elbow and humeral flexion and forward-backward trunk action
Stage 3 Technical	Making a winning stroke - Technical	The player tries to position themselves in a favorable position to use a specific offensive shot (smash or dropshot)	The length of the rallies is medium (5–6 hits). The shuttlecock trajectories vary only to allow the player to systematically use a specific offensive shot. Players make as many forced errors as unforced errors. The players' overhead forehand strokes are based on upward and backswing arm action and trunk rotation
Stage 4 Contextual	Developing a tactical sequence - Tactical and technical	The player develops tactical project with a combination of offensive and defensive shots. They continuously seek free space and opportunities to win the point	The rallies are long (7 or more hits). The shuttlecock trajectories vary using the width and the depth of the court, and players hit strokes in interception to pressurize the opponent. Players make more forced errors compared to unforced errors. The players' overhead forehand strokes are based on upward and backswing arm action and trunk rotation
Stage 5 Expertise	Enforce a style of play - Physical, tactical and technical	The player anticipates and adapts his style of play to the opponent's style	The rallies vary in length, depending on the players' personal style of play (offensive, defensive...). The shuttlecock trajectories vary using the width and the depth of the court. Players make more forced errors compared to unforced errors. The players' overhead forehand strokes are based on upward and backswing arm action and trunk rotation

their SI. This study fine-tuned the connection between the students and the learning tasks more precisely by exceeding the common criterion related to the students' technical skills (Casebolt & Zhang, 2020; Wang & Moffit, 2009). It has also extended current knowledge in the field of interest theory since the learning tasks were designed to reflect different students' game intentions, intertwining the organism, environmental and task constraints. This will offer physical educators conceptual guidelines on how to design learning tasks which increase motivation during their PE lessons.

Three assumptions were made for this study: If a learning task is primarily designed to reflect the intention of

(1) returning the shuttlecocks one more time than their opponent, then it should match with the students in the structural stage, and result in higher scores for the SI dimensions.

(2) placing the shuttlecocks in locations away from the opponent, then it should match with the students in the functional stage, resulting in higher scores for the SI dimensions.

(3) making a winning stroke by using a specific offensive shot, then it should match with the students in the technical stage, also resulting in higher scores for the SI dimensions.

Methods

Participants

The present study sample consisted of 97 students ($M_{age} = 13.0$, $SD = 1.4$, 50.5% girls, aged 11–16) from four PE classes taken from one middle school located in a Northern region of France.

The four teachers involved in this study were male, full-time certified PE teachers and had teaching experience ranging from 10 to 15 years. The teachers belonged to schools identified as “socially mixed, relatively underprivileged” according to the French department of education classification (Ministère de l'Éducation Nationale, 2005). Students were in 6th (54%), 8th (28%) or 9th (18%) grade. Class sizes ranged from 22 to 30 students per class. The conative classification grid in badminton, was used to associate the students with a conative stage according to their levels of expertise. The students were videotaped and classified into one of the five conative stages, during the first two lessons of the badminton-unit based on the classifying indicators as described in Table 1. These indicators were related to the players' game intentions derived from the three components described in the conative framework: the physical component with the length of the rally (Dieu, Schnitzler et al., 2020), the tactical component with the shuttlecock trajectories and the ratio between forced and non-forced errors (Laffaye et al., 2015) and the technical component with the arm and trunk actions in overhead forehand strokes (Wang et al., 2009). This conative classification grid was certified by a video testing of the 10 badminton specialists during a national committee to recruit PE teachers (Dieu, Schnitzler et al., 2020). For the present study, two expert analysts classified the students independently. Chronbach's alpha was considered excellent ($\alpha = 0.91$). This pre-intervention data revealed that the participants had been categorized into the first three stages with 45 students in the structural stage, 41 students in the functional stage and 11 in the technical stage. 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 from all of them. All parents allowed their children to participate in the study.

Design and description of learning tasks

The authors of the study, specialists in PE teaching and racket sports, designed the three learning tasks in collaboration with the PE teachers of the classes. Each task has been designed to match with a student's specific conative stage by using the game intention: the "Cumulative score" task with the structural stage, the "Banco bonus" task with the functional stage, and the "Tournament" task with the technical stage.

The first task, referred throughout the manuscript to as the "Cumulative score" task, was designed to reflect the game intention of returning the shuttlecock one more time than the opponent using a secure style of play to avoid non-forced errors. Therefore, it involves primarily the physical component of the badminton game. This was a match between two heterogeneous teams of three students who played one after the other, with the principle of students adding their personal points to their team's overall score. The students were grouped into heterogeneous teams of three players: one student in the structural stage, one student in the functional stage, and one student in the technical stage. This composition of the teams ensured that each student had the chance to win their match, since each match opposed students with the same conative stage (students in the structural stage competed against each other, as well as students in the functional and technical stages). Each student played a single match of five minutes with a cumulative score running for each team, throughout the three matches (three students in each team). The matches were played in the following order: students in the structural stage, students in the functional stage, and students in the technical stage. The cumulative scoring system was used to promote optimal involvement on each point played. In fact, the goal for the students was not only to score more points than their opponents but above all to score as many points as possible (or lose as few as possible) to ensure that their partners could start their matches with a scoring advantage (or with the lowest scoring disadvantage possible). Adopting a secure style of play (i.e., without risk) which results in a long rally to return the shuttlecock one more time than the opponent, and minimizes the non-forced errors, is particularly well-suited to reducing the difference in points against an opponent (when you are behind in scoring) or to keep it (when you are ahead in scoring). In sum, the "Cumulative score" task promoted the physical component of the game as each point played was important for the students and their team. In that sense, this task was particularly adapted to the students in the structural stage, since their game intention is to be physically engaged in returning the shuttlecocks one more time than their opponent. This was useful to gain points or to avoid losing points so as to give their next team player the opportunity to start their match with an advantage or without a deficit score (e.g., up to four points behind).

The second task, referred throughout the manuscript to as the "Banco bonus" task was designed to reflect the game intention of identifying a free space and making a tactical choice. Therefore, it promotes primarily the tactical component of the badminton game. This was a single match of five minutes, on a court separated in three areas: the front area corresponding to the space between the net and the first service line, and the left and right side court areas which correspond to the rest of the court divided by the middle line. During this match, a student in a lower conative stage could challenge a student in a higher conative stage while taking advantage of a bonus scoring system. This bonus corresponded to the identification of a free area (i.e., an area located far away from the opponent), and to a winning stroke concluded in this free area (i.e., either the shuttlecock hits the floor in the area or the opponent makes a fault while positioned in this area). To activate this bonus during a point, the student had to shout clearly "Banco" before hitting the shuttlecock toward the identified free area. With this bonus, the students could earn three or five additional points rather than one if its use led to winning the point. The bonus scoring system was set to three points if the students were separated by one conative stage (e.g., a student in the structural stage who challenged a student in the functional stage) or five points if they were separated by two conative stages (e.g., a student in the structural stage who challenged a student in the technical stage). The goal for the students was to choose the right opponent to challenge, identify a free area, and make tactical decisions within the match to use their bonus adequately to win three or five points. Consequently, this task was particularly suited for the students in the functional stage since their game intention is to be tactically engaged to place the shuttlecocks in locations away from the opponent and used decision-making skills to win bonus points.

The third task, referred throughout the manuscript to as the "Tournament" task was designed to reflect the game intention of making a preferential winning stroke to shorten the point. Therefore, it involves the technical component of the game in order to win the match. It consisted of multiple single matches played in a row between students organized on several courts ranked from one (i.e., the highest) to eight (i.e., the lowest). During the matches, players could earn three points (rather than one) if they made a winning stroke with their preferential shot (players had to choose between the smash or the dropshot before each match). After each five minute match, the students moved from their court to play against a different opponent. When a student won a match, they moved to a higher-ranked court, whereas when they lost a match, they moved to a lower-ranked court. The goal was to win matches against different opponents with the aim of reaching the first court (i.e., the best) and avoid the eighth court (i.e., the worst). For example, the winner of the match on the third court went up to the second court while the loser went down to the fourth court. As the goal of this task was to win as many matches in a row as they could, it promoted the technical dimension of the game because students were using their preferential shot (smash or dropshot) to shorten the point and win extra-points. In order to be able to play one match after another, the players realized the need to adopt an economical style of play. Accordingly, this task was particularly suited for the students in the technical stage since their game intention is to be technically engaged by making winning strokes using a preferential offensive shot.

Table 2. Summary of the three learning tasks designed in badminton.

Learning tasks	Game intention	Component(s) involved	Description	Conative stage targeted
Cumulative score task	Returning the shuttlecock one more time than the opponent	Physical component	Match between two heterogeneous teams of three students who play one after the other, with the principle of students adding their personal points to their team's overall score	Structural stage
Banco bonus task	Identifying a free space and making a tactical choice	Tactical component	Single match of five minutes, on a court separated into three areas: the front area corresponding to the space between the net and the first service line, and the left and right side court areas which corresponded to the rest of the court divided by the middle line. During this match, a student in a lower conative stage could challenge a student in a higher conative stage while using a bonus scoring system	Functional stage
Tournament task	Making a preferential winning stroke to shorten the point	Technical component	Multiple single matches played in a row between students organized on several courts ranked from one (i.e., the highest) to eight (i.e., the lowest). During the matches, players could earn three points (rather than one) if they made a winning stroke with their preferential shot (players had to choose between the smash or the dropshot before each match).	Technical stage

The three learning tasks described above are summarized in [Table 2](#)

Fidelity of intervention

Since the three learning tasks were built in collaboration between the researchers and the PE teachers, content fidelity was ensured as the teachers shared the same learning task benchmarks. These benchmarks included the following elements for each task: goal for students, task presentation, demonstration, activity description, equipment, and material. Prior to conducting the study, three training sessions were organized for the teachers. These training sessions consisted of teaching the three learning tasks to similar classes that the teachers had in their schools. During these sessions, a researcher observed the teachers using the benchmarks and a coding system that evaluated each element's fidelity (goal, task presentation, demonstration, and students' organization). This coding system was composed of three letters relating to the fidelity of intervention (A = high fidelity, B = good fidelity or C = low fidelity). The three training sessions allowed the teachers to reach a minimum of A and a few B ratings on the relevant benchmarks. Following the training sessions, the researcher was present at the three PE lessons in which the "Cumulative score" task, the "Banco bonus" task, and the "Tournament" task were implemented, to assess the teachers' fidelity to the benchmarks (using the same coding system as in the training sessions). Prior to these PE lessons taking place, the teachers informed students that the researcher would be present during lessons. The researcher was positioned within view of the lesson but was seated strategically to avoid any disruption.

Measures

Situational interest

The French 15-item SI Scale (Roure et al., 2016) was used to measure students' SI during the learning tasks. The scale includes five SI dimensions: 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 analyze 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 dimension of SI consists of three items. The 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) = 0.93, Normed fit index (NFI) = 0.93, Comparative fit index (CFI) = 0.96, Root mean squared error of approximation (RMSEA) = 0.06). They also reported internal consistency (Cronbach's alpha) for novelty (0.83), instant enjoyment (0.84), exploration intention (0.79), attention demand (0.76), challenge (0.77), and total interest (0.85) among middle and high school students.

Data collection

This study took place during the students' regularly scheduled PE class held once a week in the French context. The badminton unit consisted of seven 50 minutes lessons. Each lesson began with general and specific warm-ups, followed by a learning task targeting a specific goal, and finished with cool-down activities to summarize the learning which had occurred during the lesson. During the first two lessons of the unit, the students were observed and classified into the conative stages during a mix of drills, tactical learning tasks, and matches. Then during the following five lessons, the students practiced the three learning tasks designed, in a random order, and with a one-week interval between the tasks to avoid any proximity between them. For instance, a student practiced the "cumulative score" task during the third lesson, then the "banco bonus" task during the fifth lesson and finished with the "tournament" task during the seventh lesson. Immediately after practicing each task, students responded to the French SI scale (Roure et al., 2016). 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, students were encouraged to answer honestly and were assured that their responses would remain anonymous and confidential.

Data analyses

Students' responses were aggregated respectively to the five dimensions of SI: instant enjoyment, exploration intention, attention demand, challenge, and novelty. The statistical analyses were performed using the following steps. Preliminary analyses were conducted on the study variables to examine the normality, multicollinearity, internal reliability of the subscales, and construct validity. Then, a 3 (students' conative stages) X 3 (learning tasks) repeated measures multivariate analyses of variance (MANOVA) was performed to examine the interaction effects between these two variables. Depending on the statistical significance of this analysis, three further MANOVAs were conducted to examine the differences between the dependent variables within a multivariate framework. The dependent variables were the five SI dimensions, while the independent variable was the students' conative stages. Pillai's F statistic was used for the MANOVAs to determine the statistical significance of the multivariate model because it controlled for the type I error rate with unequal sample sizes (Ntoumanis & Myers, 2016). Follow-up univariate ANOVAs were then conducted based on the statistical significance of the MANOVAs. A Bonferroni post hoc test was employed if there were any statistical differences in the SI dimensions. Version 25.0 of SPSS (SPSS Inc, Chicago, IL) was used for all statistical analyses.

Results

Preliminary analyses

Analysis of the skewness (-.41 to .19) and kurtosis (-1.16 to -.20) values revealed that the data were normally distributed and no multicollinearity problems were found between variables. Internal consistencies of the SI scale were good with Cronbach's alphas of .81 for instant enjoyment, .81 for exploration intention, .85 for attention demand, .82 for challenge and .86 for novelty, respectively. Due to the hierarchical nature of the data (i.e., students data nested in classes), the amount of variance explained by classes-level variance was analyzed. Results showed that the intraclass correlation (ICC) for students' instant enjoyment was .032, meaning that between-classes variability accounted for 3.2% of the variance of students' instant enjoyment. Similarly, the ICC for the other SI dimensions ranged between .014 and .043, indicating a low between-classes variance. Under those circumstances and according to Preacher et al. (2011), the 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 analyses.

To test the construct validity of SI in this study, we performed a confirmatory factor analysis (CFA). The measurement model of all five latent constructs and 15 indicators (15 indicators for the five SI dimensions) yielded good fit to the data in all learning tasks: cumulative score task, [$\chi^2(102) = 181.56; \chi^2/df = 1.78; CFI = .96; NFI = .93; TLI = .95; RMSEA = .052$ with $CI_{90} = .047-.059$]; banco bonus task, [$\chi^2(102) = 212.16; \chi^2/df = 2.08; CFI = .95; NFI = .92; TLI = .95; RMSEA = .055$ with $CI_{90} = .048-.061$]; and tournament task, [$\chi^2(102) = 197.88; \chi^2/df = 1.94; CFI = .96; NFI = .93; TLI = .95; RMSEA = .054$ with

Table 3. Differences between the three conative stages on situational interest dimensions for the "Cumulative score task."

	Structural stage N = 45		Functional stage N = 41		Technical stage N = 11		F(1, 97)	η^2
	M	SD	M	SD	M	SD		
Instant enjoyment	13.55 ^a	1.62	11.05 ^b	3.19	12.91 ^a	1.63	8.29*	.15
Exploration intention	10.82 ^a	2.40	8.12 ^b	2.84	10.14 ^a	3.96	10.69*	.19
Attention demand	11.78 ^a	2.48	8.37 ^b	3.27	9.54 ^b	3.88	14.01*	.23
Novelty	7.60 ^a	4.14	7.05 ^a	3.16	6.63 ^a	1.28	1.23	.02
Challenge	9.60 ^a	2.47	6.14 ^b	2.59	6.00 ^b	2.90	22.15*	.32

Note. F: test value; * $p < .001$; η^2 : effect size. ^{a, b}: these values are significantly different from each other.

$CI_{90} = .048-.060$]. The factor loadings of the indicators ranged between .74 and .91, indicating a good construct validity.

Results from the coding system used to ensure the fidelity to the benchmarks revealed a high fidelity of intervention with A-ratings for all elements and for all PE teachers. The results of this study are presented according to the three learning tasks.

Students' situational interest when experiencing the learning tasks

The results from the 3 (students' conative stages) X 3 (learning tasks) repeated measures MANOVA revealed significant interaction effects between the students' conative stages and the learning tasks, *Pillai Trace* = .19, $F(20,172) = 2.28, p < .001, \eta^2 = .11$. Accordingly, further MANOVAs were performed to examine the differences in the SI dimensions scores between the three conative stages within each learning task.

Cumulative score task

The results from the MANOVA revealed a significant main effect in SI dimensions scores for the three conative stages, *Pillai Trace* = .57, $F(5,90) = 7.28, p < .001, \eta^2 = .29$. Table 3 reports the means, standard deviations and differences between the three conative stages based on SI measures. Follow-up univariate ANOVAs tests indicated that mean scores for SI dimensions differed significantly between the three conative stages. Post hoc tests using the Bonferroni correction revealed that students in the structural and technical stages reported higher scores for instant enjoyment than students in the functional stage (13.55 and 12.91 vs. 11.05, $p < .01$). The same trend was observed for exploration intention (10.82 and 10.14 vs. 8.12, $p < .01$). Moreover, students in the structural stage received higher scores for attention demand and challenge in comparison to students in the functional and technical stages (11.78 vs. 8.37 and 9.54, $p < .01$; 9.60 vs. 6.14 and 6.00, $p < .01$).

Banco bonus task

The results from the MANOVA revealed a significant main effect in SI dimensions scores for the three conative stages, *Pillai Trace* = .69, $F(5,90) = 9.35, p < .001, \eta^2 = .34$. Table 4 reports the means, standard deviations and differences between the three conative stages based on SI measures. Follow-up univariate ANOVAs tests indicated that mean scores for SI dimensions differed significantly between the three conative

Table 4. Differences between the three conative stages on situational interest dimensions for the “Banco bonus task.”

	Structural stage N = 45		Functional stage N = 41		Technical stage N = 11		F(1, 97)	η^2
	M	SD	M	SD	M	SD		
Instant enjoyment	10.64 ^a	2.98	13.56 ^b	1.89	12.51 ^b	1.81	8.87*	.16
Exploration intention	9.87 ^a	3.66	11.00 ^a	2.41	7.56 ^b	2.88	4.86*	.10
Attention demand	8.22 ^a	2.44	11.27 ^b	2.07	9.78 ^b	3.35	15.65*	.25
Novelty	7.84 ^a	3.96	7.12 ^a	3.78	7.22 ^a	4.41	.38	.00
Challenge	9.33 ^a	3.15	8.88 ^a	2.67	6.33 ^b	2.18	5.30*	.10

Note. F: test value; * $p < .001$; η^2 : effect size. ^{a, b}: these values are significantly different from each other.

Table 5. Differences between the three conative stages on situational interest dimensions for the “Tournament task.”

	Structural stage N = 45		Functional stage N = 41		Technical stage N = 11		F(1, 97)	η^2
	M	SD	M	SD	M	SD		
Instant enjoyment	8.39 ^a	2.71	11.73 ^b	2.96	14.09 ^c	1.14	27.69*	.37
Exploration intention	6.51 ^a	2.40	9.02 ^b	2.81	12.91 ^c	1.70	31.32*	.40
Attention demand	9.38 ^a	3.58	9.56 ^a	3.00	12.73 ^b	2.49	4.98*	.10
Novelty	8.02 ^a	4.18	7.22 ^a	3.81	6.00 ^a	3.82	1.26	.03
Challenge	9.53 ^a	2.42	6.46 ^b	3.11	6.54 ^b	3.47	13.79*	.23

Note. F: test value; * $p < .001$; η^2 : effect size. ^{a, b, c}: these values are significantly different from each other.

stages. Post hoc tests using the Bonferroni correction revealed that students in the functional and technical stages reported higher scores for instant enjoyment than students in the structural stage (13.56 and 12.51 vs. 10.64, $p < .01$). Moreover, students in the functional stage received higher scores for exploration intention compared to students in the technical stage (11.00 vs. 7.56, $p < .01$), and higher scores for attention demand compared to those in the structural stage (11.27 vs. 8.22, $p < .01$). Finally, students in the structural and functional stages reported higher scores for challenge in comparison to students in the technical stage (9.33 and 8.88 vs. 6.33, $p < .01$).

Tournament task

The results from the MANOVA revealed a significant main effect in SI dimensions scores for the three conative stages, $Pillai Trace = .76$, $F(5,90) = 11.12$, $p < .001$, $\eta^2 = .38$. Table 5 reports the means, standard deviations and differences between the three conative stages based on SI measures. Follow-up univariate ANOVAs tests indicated that mean scores for SI dimensions differed significantly between the three conative stages. Post hoc tests using the Bonferroni correction revealed that students in the technical stage reported higher scores for instant enjoyment than students in the functional stage, who also reported higher scores compared to those in the structural stage (14.09 vs. 11.73 vs. 8.39, $p < .01$). The same trend was observed for exploration intention (12.91 vs. 9.02 vs. 6.51, $p < .01$). Moreover, students in the technical stage received higher scores for attention demand in comparison to students in the structural and functional stages (12.73 vs. 9.38 and 9.56, $p < .01$). Finally, students in the structural stage perceived the

tournament task as more challenging compared with students in the functional and technical stages (9.53 vs. 6.46 and 6.54, $p < .01$).

Discussion

The purpose of this study was to determine the extent to which matching three learning tasks with students' conative stages in badminton can increase their SI. Using the conative stages to characterize students' expertise levels in badminton, this study fine-tunes the connection between the students and the learning tasks by exceeding the common criterion related to the students' technical skills.

Fitting the learning tasks to the students' conative stages

According to the differences related to the SI dimensions scores between the three conative stages for each learning task, it is possible to conclude that our three assumptions were validated. Overall, matching the three learning tasks to the students' game intentions resulted in higher SI dimensions scores. Consistent with the description of the learning tasks in the method section, the “Cumulative score” task fits particularly well with the students in the structural stage, the “Banco bonus” task with the students in the functional stage, and the “Tournament” task with those in the technical stage. From a conative perspective, this result can be explained by the concept of socio-conative consonance (Bui-Xuân & Récopé, 2006) which refers to the adequacy between the goal of the learning task and the student's game intention. In other words, the characteristics of the learning task fit well with the meaning attributed by the student to their activity and preferential register of action (Bui-Xuân & Récopé, 2006).

Considering the results obtained for the “Cumulative score” task, it is possible to argue that this learning task matches with the students in the structural stage, and to a lesser extent to those in the technical stage. In that sense, we can consider that the first assumption of this study is partially validated. These findings can be explained by the specific roles dedicated to the students in the structural and technical stages. In the “Cumulative score” task, the student who starts (i.e., students in the structural stage) is given a higher level of responsibility regarding the scoring system for their team. The cumulative score implies that the focus of this student is not to win but to lose as few points as possible during the five minutes match. This is important, so as to allow their teammate to start the match without a huge deficit score. Therefore, the objective of the students in the structural stage is to engage and resist for five minutes, which means physically fighting to return all the shuttlecocks one more time compared to their opponent. This activity adequately represents the player's game intention prevalent in the structural stage (Dieu, Llena et al., 2020). Along with the specific role of “starters” attributed to the students in the structural stage during this task, students in the technical stage endorse the role of the “finishers” in so far as they conclude the opposition between the two teams. In that

sense, it comes as no surprise that these students reported high scores for instant enjoyment and exploration intention since they control the game's outcome.

According to the results reported for the "Banco bonus" task, this learning task offers a good match with the students in the functional stage. Therefore, we can consider that the second assumption of this study is validated. The characteristics of this learning task engender specific thinking from the students; to make the correct choice before and during the match. Before the match, they choose an opponent who they perceive is of a similar level to them, to adjust a specific tactic. This is to ensure an optimal challenge. And during the match, the students have to carefully adapt their tactics to identify a free area and to use it at the right time to win the bonus point. From this perspective, the activity of these students is adequately related to their game intention which is prevalent in the functional stage.

Regarding the results in relation to the "Tournament" task, this learning task fits well to the students in the technical stage. Thus, we can consider that the third assumption of this study is validated. According to the goal of this learning task, which is to achieve the best ranking in the tournament, students have to preserve their physical resources over time and play technically to beat their opponents. Since the tournament is quite long, with repetitive matches of five minutes, technical efficiency appears to be the key to success in this task. Students have to use a preferential offensive shot to make a winning stroke and scores three points. In that sense, this activity fits with the player's game intention which is prevalent in the technical stage.

In conclusion, matching learning tasks with students' conative stages extends current knowledge in the fields of both CLA and interest theory. From the CLA perspective, we could assume that the conative stages link the three categories of constraints (organism, environment and task) particularly well via the concept of game intention. The conative stages are therefore a subjective way of characterizing student expertise based on a classification grid that reflects not only the mechanical aspect of expertise (technical skills, tactical indicators or physical variables), but also the specific relationship between mechanical and functional aspects of expertise (the game intentions that guide the students). Furthermore, the concept of game intention emerges out of the interaction between a student and their environment explaining why students report higher SI dimension scores when the learning task fits well with their game intention. Overall, the concept of game intention is central to the understanding of the fit between the students' conative stages and the learning tasks since it is strongly connected with the SI construct.

Designing situationally interesting tasks in badminton

Despite the interesting link between the learning tasks and the students' conative stages, this study confirms the specific roles of the SI dimensions when PE teachers design motivating tasks for their students (Roure & Pasco, 2018). Consistent with previous studies in PE, instant enjoyment, exploration

intention and attention demand are the major dimensions from which students perceived the learning tasks as motivating (Roure, Kermarrec, & Pasco, 2019; Roure, Lentillon-Kaestner et al., 2019; Roure, Méard et al., 2019; Roure & Pasco, 2018). These three SI dimensions activate higher-order cognitive processes from students contributing to and maintaining positive motivation in PE (Roure & Pasco, 2018). More specifically in badminton, it is logical to identify exploration intention and attention demand as key dimensions, since this activity requires tactical and technical skills, fast information processing and continuous decision making (Phomsoupha & Laffaye, 2015). According to Nadzalan et al. (2018), badminton players frequently develop offensive and defensive tactics while producing high-intensity movements, such as lunges, shuffles, and vertical jumps. This means that the technical, tactical and physical components of the game are intertwined.

In line with Roure and Pasco (2018)'s study in badminton and more generally with previous studies in PE (e.g., Roure, Lentillon-Kaestner et al., 2019), the dimension of challenge is involved differently into the motivational aspects of the learning tasks. This study confirms the need to find an optimal challenge in the learning tasks (Roure & Pasco, 2018), which means having medium scores for challenge and high scores for instant enjoyment. This is particularly relevant in the "Cumulative score" task for the students in the structural stage since the physical challenge induced by their role of starters has led them to perceive the task as optimally challenging and enjoyable at the same time. The same effect was observed for the students in the functional stage when playing the "Banco bonus" task, since they reported a medium score for challenge and a high score for instant enjoyment. However, this was not particularly the case for the students in the technical stage during the "Tournament" task as they received a high score for instant enjoyment but quite a low score for challenge. It could be explained by the fact that these students were in the higher conative stage compared to their counterparts and thus have perceived the task as easy when competing against weaker students. This study confirms that PE teachers might look closely at the power relationship between students in badminton by highlighting the need of optimally challenging tasks. This is a key factor in explaining students' involvement (Dieu, Llena et al., 2020).

Conclusion

Unlike Roure and Pasco's (2018) study, this study used the students' game intentions to match them with three learning tasks designed in badminton. This study has fine-tuned the connection between the students' expertise levels (i.e., conative stages) and the learning tasks by exceeding the common criterion strictly related to the students' technical skills (Casebolt & Zhang, 2020; Wang & Moffit, 2009). This study clearly shows that when a task is designed to reflect the player's game intention, the student is highly situationally interested. This suggests that physical educators and teachers might design learning tasks reflecting the different students' game intentions to elicit their SI. Extending previous results obtained by Roure and Pasco (2018) study, this study shows that the design of effective learning tasks not only relies on using a specific game format

that might be popular in PE classes (e.g., the Tournament task in the French PE context) but is highly dependent on the students' game intentions. By matching the students' game intentions and the learning tasks, this study has also confirmed that instant enjoyment, exploration intention, attention demand, and challenge were key dimensions underlying students' motivation in badminton in relation to its technical, tactical and physical components.

Some limitations of the study should be considered when interpreting or generalizing our findings. Firstly, this study used the learning tasks as the units of analysis to specifically investigate the effects of matching tasks to students' conative stages on students' SI. Future studies should consider designing units of four to six lessons in badminton for a specific conative stage to increase the length of data collection. This would allow researchers to evaluate students' SI in repeated measures design and to add complementary variables (e.g., students' learning). This will also help researchers understand the relationships between SI and learning outcomes better. Secondly, this study was conducted in a French PE context. Future studies are needed to examine the match between the students' conative stages and learning tasks in other contexts to generalize our results. Thirdly, this study used students' SI as the outcome to determine the matching of learning tasks with students' conative stages. Since this is a self-report measure that could be considered as subjective, future studies could add students' physical activity measure (e.g., by using accelerometers) to add an objective outcome related to the students' involvement during the learning tasks.

What does this article add?

Considering the common criterion usually adhered to when classifying students' expertise levels in badminton, which is related to the students' technical skills, this study fine-tunes the connection between the students' game intentions and the learning tasks. This study adds to the literature since it provides empirical evidence of matching learning task design to students' conative stages to enhance students' situational interest. It also demonstrates that the concept of game intentions is a key to understanding the underlying motivation behind students' engagement in badminton learning tasks.

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