The mediating role of cognitive variables between learning oriented climate and physical activity intention

Vello Hein and Maret Müür

Institute of Sport Pedagogy and Coaching Sciences, Faculty of Exercise and Sports Sciences, University of Tartu, Estonia

Manuscript resubmitted: 03.02.2004

Published in 2004 Vol.35 N1 International Journal of Sport Psychology, pp. 60-76
Cognitive processes and learning climate
Abstract

This research examined the mediating role of cognitive variables: self-regulation, confidence-efficacy, attention-concentration, willingness to engage and use of strategies between the learning environment and physical activity intention. The participants, age 12-18 years (N = 944), completed the Cognitive Processes Questionnaire in Physical Education (CPQPE) (Solmon & Lee, 1997), the learning orientation subscales from the Learning and Performance Orientation in Physical Education Classes Questionnaire (LAPOPECQ, Papaioannou, 1994) and physical activity intention scale developed for this study. The results of the factor analyses for the originally two learning-oriented subscales indicated the existence of four-factor structure: teacher-initiated knowledge of performance improvement, student’s satisfaction with teaching methods, student’s feelings about teachers’ satisfaction with their learning and students’ wishes to make an effort and feel enjoyment. The path model revealed that self-regulation and use of strategies were the most important mediators between the perceived learning oriented climate and physical activity intention.

Key words: learning climate, cognitive processes, physical activity intention
The mediating role of cognitive variables between learning oriented climate and physical activity intention

In recent years, researchers in educational settings have stressed the role of physical education in public health and the importance of physical education to motivate students to adopt exercise as a lifestyle habit. For a better understanding of the multifaceted process of teaching and learning, it is important to examine how students think about this process. Cognitive processes are defined by Wittrock (1986) as students’ thoughts or cognitions that impact learning, including their beliefs, perceptions, expectations, levels of motivation, and use of strategies. Several researchers (Lee, Landin, & Carter, 1992, Solmon & Lee 1997) have used the mediating process paradigm of Doyle (1977) as a framework to investigate students’ cognitive processes and the relationship of these processes to students’ outcomes in learning. One of the main objectives of the contemporary physical education is to educate students for lifelong physical activity. Thus, the adolescents with habit to exercise physically or who have at least an intention to partake in physical activity after graduation may be view as the result of learning outcome in physical education. Therefore, in this study we focused on the cognitive processes as mediators between learning oriented climate and students’ physical activity intention.

Learning-oriented climate and cognitive variables in physical education

Achievement goal theory emphasizes the cognitive and effective determinants and consequences of behavior and assumes that the individual is an intentional, goal-directed organism operating in a rationale manner. In the achievement setting of sport, two goal orientations are evident: task and ego (Nicholls, 1984). Further, Nicholls (1989) and Ames (1992) have noted that individuals can be more or less task-oriented or ego-oriented as environments created by teachers and parents can be perceived to be more or less task-involving and ego-involving. These two climates were labeled learning- and performance-
Cognitive processes and learning climate

oriented. Specifically, perceptions of a learning oriented climate were related to the reported use of more effective learning strategies, a preference for more challenging task, more positive attitudes toward the class, and the belief that effort leads to success (Ames & Archer, 1988; Walling, Duda, & Chi, 1993).

Several researchers (Duda, 1992; Roberts, 1992; Goudas & Biddle, 1994) utilizing the goal perspective approach of Nicholls (1989) have showed that dispositional factors such as achievement goal orientations as well as situational factors, such as perceived class climate in PE, influence the intrinsic interest of students. White and Duda (1994) have found a task orientation to correspond with more intrinsic motives for involvement (e.g., skill development, enhancing one’s level of fitness). Ntoumanis and Biddle (1999) have noted that climates can also influence the effort, persistence, cognitions, emotions and behavior of individuals in physical activity contexts. Spray and Wang (2001) also argued that high task orientation should correspond to greater feelings of intrinsic motivation, whereas ego orientation is more likely to decrease the willingness to engage in a task for its own sake.

Students are more likely to want to continue their involvement in an activity if their physical education lessons allow them to experience self-determination, and feel competent in their own abilities (Greenwood-Parr & Oslin, 1998).

Papaioannou (1994), based on the theories of achievement motivation (Dweck & Leggett, 1988; Nicholls, 1989), developed the Learning and Performance Orientation in Physical Education Classes Questionnaire (LAPOPECQ). This research, with Greek students, established a hierarchical structure for the LAPOPECQ comprising two higher-order factors. The first factor was formed by two subscales assessing learning climate or mastery climate (teacher initiated learning orientation and students learning orientation), and the second by three subscales assessing performance climate (students’ competitive orientation, students’ worries about mistakes and outcome orientation without effort).
Papaioannou (1994) found that the importance of teachers in the development of a high learning-oriented environment and the perception of learning orientation was moderately related to intrinsic motivation, interest in the lessons, and perceived usefulness of the lesson. Up to now this instrument has been widely used by researchers. Goudas and Biddle (1994) investigated the motivational climate on the sample of English students using an adaptation version of the LAPOPECQ. The results of the principal factor analysis indicated that the items of subscales class learning orientation and teacher’s promotion of learning orientation were split across two factors. However, the results of the both studies revealed that the perception of the learning orientation climate was positively related with intrinsic motivation, whereas the perception of learning climate as performance oriented was not. Therefore, a particular interest of the present investigation is an examination of the influence of a learning orientation climate on physical activity intention.

Although the effect of learning climate in physical education lessons on positive psychological outcomes have already proved by many researchers, there is a lack of studies concerning the relationships between learning oriented climate and cognitive processes. In 1997 Solmon and Lee developed the Cognitive Processes Questionnaire in Physical Education (CPQPE) for measuring cognitive variables that impact achievement. This questionnaire consists of five subscales to measure self-regulation, confidence-efficacy, attention-concentration, willingness to engage and use of strategies. The authors found that the subscales of the CPQPE were related to a task-involved goal perspective and the belief that success is attributed to motivation and effort. The strongest relationship was followed with the self-regulation subscale. The items designed to measure the self-regulation subscale of CPQPE are quite similar to those presented by Ryan and Connell (1989) to investigate intrinsic motivation, which are developed on the basis of self-determination theory (Deci & Ryan, 1985).
Physical activity intention

Studying physical activity intention is important, because this is the immediate determinant of behavior and educating physically active students is the main purpose of contemporary physical education. Intention is considered to be a motivational variable and is a context-specific representation of goal-directed behavior (Bloom, 2000). Recently researchers have begun to investigate intensively the determinants of physical activity intention among schoolchildren (Norman, Conner and Bell (1999), Mummery, Spence & Hudec, 2000; Escartí & Gutierrez, 2001; Hagger, Chatzisarantis, & Biddle, 2001; Hagger, Chatzisarantis & Biddle, 2002; Standage, Duda & Ntoumanis, 2003). The results of these studies highlighted the role of self-regulated behavior in forming the physical activity intention. More recently Standage, Duda and Ntoumanis (2003) investigated the mediating variables between perception of mastery climate and intention. In the proposed model the important roles of perceived autonomy and self-determined motivation as mediators between learning oriented climate and intention were established.

Utilizing a goal perspective framework, Biddle, Soos and Chatzisarantis (1999) and Lintunen, Valkonen, Leskinen and Biddle (1999) developed the models for predicting physical activity intention in 12 to 16-year-old adolescents. Both models demonstrated the direct effect of task orientation and indirect effect of ego orientation on physical activity intention. As noted earlier (see the first section), learning oriented climate is the antecedent of the task orientation and these are related with cognitive variables such as confidence-efficacy, attention-concentration, willingness to engage and use of strategies. Consequently, these cognitive variables may also play the role of mediators between learning oriented climate and physical activity intention.

It was hypothesized that a learning environment perceived by students as learning oriented enhances their feelings about self-regulation, confidence-efficacy, attention-
concentration, willingness to engage and use of strategies, which in turn leads to increased intention to be physical active.

The purposes of this study were to (a) estimate the role of cognitive variables as mediators between the perceived learning climate and students’ intention, (b) develop a simple instrument to estimate physical activity intention of students and (c) test the suitability of the Cognitive Processes Questionnaire in Physical Education (CPQPE) and the learning/mastery orientation subscales from the Learning and Performance Orientation in Physical Education Classes Questionnaire (LAPOPECQ) for use in Estonian sample,

Method

Participants and Procedure

The subjects in this study were 944 schoolchildren (504 girls, 440 boys) from junior (n = 396) and senior high schools (n = 548) located in different towns of Estonia. The students in the junior high schools ranged in age from 12-15 years, M age = 13.5 years, SD = 1.29 and the students in the senior high schools ranged in age from 16-18 years, M age = 16.7 years, SD = 0.93. The permission to carry out the study was obtained from the headmaster of the school and the class-teacher. Before the main research, the control test was carried out to confirm the understanding of the questions. First, a small group (13 students) read through the questions and after that the researcher read the questions loudly, asking whether or not they understood the items. After this, the main research was carried out. The purpose of the study was explained to the students and they were confirmed that their answers would remain confidential and the questionnaires will use only the researchers. Students filled the questionnaire in the classroom and before implementation they got an exact introduction. It was also emphasised that the questionnaire is designed to measure students' general feelings about physical education classes and not about one particular class. The questionnaire took
approximately 15-20 minutes to complete. The completed questionnaires were collected by one of the researchers.

Instrumentation

The students' cognitive processes were assessed by the responses to the Cognitive Processes Questionnaire in Physical Education (CPQPE) developed by Solmon and Lee (1997). The CPQPE is a 33-item scale consisting of five different subscales: self-regulation, confidence-efficacy, attention-concentration, willingness to engage and strategies to measure cognitive processes. Each item is rated on a five-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree). The subscales “Teacher-Initiated Learning Orientation” and “Students' Learning Orientation” from the LAPOPECQ (Papaioannou, 1994) were used to measure students’ learning climate.

Additionally, six items for measuring intention to participate in physical activity after graduation was elaborated specifically for this study. Items for the measurement of intention were derived through several steps. At first six new items were developed from several sources and the content of validity of the items were evaluated with the two internationally acknowledged sport psychologists. They indicated on two of the questions with which some problems may appear. In choosing the items, the researchers based on the studies of theories of reasoned action and planned behavior, where the results indicated the strong relation between attitude and intention (Ajzen, 2001; Hagger, Chatzisarantis, & Biddle, 2002; Haubenbals, Carron, & Mack, 1997). Attitude research suggests that positive intentions are important determinants of children’s decision making for physical activity and that such intention is determined by attitudes (Biddle & Chatzisarantis, 1999). The questionnaire was a five-point Likert scale, where students indicated their level of agreement with statements from strongly disagree (1) to strongly agree (5).
The construct validity of the instruments was assessed through factor analysis (exploratory and confirmatory factor analysis).

**Data analysis**

Internal consistency of reliability of each of the subscales was assessed by Cronbach’s alpha. The construct validity of the subscales of cognitive processes, learning climate and intention was tested with confirmatory factor analysis using LISREL 8.51. To test the structural construct of the intention subscale and the students’ learning climate, the total sample was randomly split to produce two subsamples, one for an exploratory factor analysis and other for a confirmatory factor analysis. Structural equation modeling procedures were used to test the relationships between dimensions of cognitive processes, learning orientation climate, and the items of intention.

**Results**

At first data preparation and screening for structural equation modeling was made to exclude mistakes in the models. The outliers were examined to eliminate cases with scores that were very different from the rest. Cases with extreme subscales scores were dropped from the sample. After examining outliers, four cases were dropped from the further analyses, resulting in data comprised from 940 students. Distributional properties of the responses to the all items were also examined. A skewness value greater than one indicated that not all variables were non-normal in distribution. Therefore, for further analyses, PRELIS 2.51 provided the polychoric correlations and its asymptotic covariance matrix. To fit the models, maximum likelihood method based on asymptotic covariance matrix was used. Standard errors and chi-square were corrected for non-normality.

To contact the CFA for CPQPE, the PRELIS program was used on the total sample to produce an external matrix file as the data source for LISREL 8.51. The results of the CFA for CPQPE of the present study (Model 1) together with the results obtained by Solmon and
Lee (1997) (Model 2) are presented in the Table I. The values of fit indexes confirmed the construct validity of CPQPE. Cronbach alpha coefficients for the subscales of the CPQPE were: self-regulation .79, confidence-efficacy .63, attention-concentration .72, willingness to engage .78, use of strategies .78.

The initial results of the CFA (goodness of fit indexes) for the two subscales (teacher-initiated learning and students’ learning orientation) from LAPOPECQ indicated unacceptable values (see Table II, Model 1). Therefore, it was decided to retest the factor structure of these subscales by EFA. In consequence of the EFA, four factors emerged (Table III). Three teacher initiated learning items (TO3, TO4, TO6) emerged in the first factor and four items of the students learning orientation (LO1, LO2, LO3, LO4) emerged in second factor. The third factor included three items (TO1, TO2, TO5) of the teacher initiated learning subscale, as did the last (LO5, LO6, LO7). The focus on the items of the new four factors showed that each factor is centered to measure a different component of learning orientation. The items of the first factor characterize the students’ perception of a teacher initiated learning climate where the teacher’s behavior is directed on the students’ performance improvement by providing knowledge about it. Therefore, this factor was labeled as teacher-initiated knowledge of performance improvement. The items of the second factor describe the learning climate where the students are satisfied with learning new skills taught using methods acceptable by them. This factor was labeled as satisfaction with teaching methods. The items of the third factor characterize the students’ feelings about teachers’ satisfaction with their learning. The fourth factor comprises the items that focused on students’ wishes to make an effort and feel enjoyment (labeled as effort/enjoyment factor).

To examine whether CFA confirms a four-factor structure, which emerged in EFA, a second CFA model with four subscales was constructed. All the measurement errors of latent
variables were made to correlate and also some items within factor (in the same factor) were allowed to correlate. Fixing the variance of the factor equal to constant scaled the latent variables. This constant was 1.0 and it standardized the latent variables. The CFA model for learning-oriented subscales confirmed the four-factor structure, as the model estimation indexes showed an acceptable fit of the model. The four-factor CFA model is presented in Figure 1. The model fit indexes are presented in the Table II (Model 2). The internal consistency reliability coefficients (Cronbach’s alpha) for each of the four subscales; knowledge of performance improvement, satisfaction with teaching methods, satisfaction of learning and effort-enjoyment were .68, .73, .81 and .71, respectively.

Six items were developed to measure physical activity intention among schoolchildren. Two of these asked directly about the physical activity plans after graduation (e.g. After graduation I would like to take part of the sport club training) while other items were developed to measure attitude. Two internationally acknowledged sport psychologists evaluated the content validity of the items. They indicated that two of the questions had inherent problems. These were excluded from subsequent analyses. The data of 940 students was randomly split to produce two subsamples, one for EFA (n=470) and the other for CFA (n=470). The results of the EFA showed that all four items emerged in one factor with a strong factor loadings over .70. This one factor solution accounted for 64 % of the variance.

Using the LISREL 8.51 statistical package, the results of the confirmatory factor analysis confirmed the existence of one factor structure emerged in EFA. The asymptotic covariance matrix was used as data input and maximum likelihood method of estimation was chosen. To standardize the latent variable, the variance of a factor has fixed to equal a constant (1.0). The factor loadings of the items were all statistically significant (standardized estimates: Item 1 = .73; Item 2 = .72; Item 3 = .84; Item 4 = .77; p<. 001). The internal consistency of the four items measured by Cronbach alpha was .81. Strong factor loadings
and the satisfactory measurement errors of the items suggest a conclusion regarding the fit of
the four new items. The standardized factor loadings and the error variances are presented in
Figure 2. The goodness of fit statistics of the CFA were: NFI = .98; NNFI = .94; CFI = .98;
GFI = .98; RMSR = .02; RMSEA = .90 with 90% confidence interval .08 - .10.

To test the hypothesized relationship between the learning oriented climate and
intention mediated by cognitive processes, such as self-regulation, confidence-efficacy,
attention-concentration, and willingness to engage and use of strategies, a path models were
used. The results of the initial path model indicated non-significant roles of confidence-
efficacy and attention-concentration in the model, and were therefore excluded from future
analysis. Following, the estimated model (Figure 3.) demonstrated adequate fit with the data
(NFI= .94, CFI= .96, GFI= .98, AGFI= .96, RMR= .05, RMSEA= .05, 90% confidence
internal for RMSEA= .048-.073). The path model indicated that different domains of
perceived learning climate and the observed mediators explained 23 % of the variance of the
intention variable.

Standardized path coefficients with absolute values less than .10 may indicate a
“small” effect, values around .30 a “medium” effect and those grater than .50 a “large” effect
(Kline, 1998). The coefficients of the model indicated that only the effort-enjoyment
subscale (L2) from the student learning orientation had a significant direct effect on physical
activity intention (standardized coefficient = .16). The standardized indirect effect of effort-
enjoyment on intention through self-regulation was .065 (.43 x .15), through willingness to
engage .067 (.27 x .25) and through use of strategies .027 (.27 x .10). The subscales of
teacher’s satisfaction with learning (T1) and the knowledge performance improvement (T2)
from teacher-initiated learning orientation had indirect effects on intention. The first (T1) had
indirect effect (.033) through self-regulation and the second (T2) via use of strategies (.024)
on intention. The most important role of the observed mediators between the learning climate
and intention, considering the sum of total indirect effects, belonged to the self-regulation (.098) and use of strategies (.059). From the four new subscales characterizing the learning climate the effort/enjoyment had a more essential total effect of .319 (the total effects are the sum of all direct effect and indirect effects of one variable upon another) on intention than other subscales.

Discussion

In this study it was hypothesized that cognitive processes, such as self-regulation, confidence-efficacy, attention-concentration, willingness to engage, and use of strategies may have a mediating role between learning oriented environment and intention to be physically active. To measure students’ physical activity intention a special scale with four items for this study was developed.

One of the purposes of the present study was also to re-test the CPQPE and the learning oriented subscales from the LAPOPECQ to obtain a reliable Estonian version questionnaire. The CFA indexes of fit confirmed the adequate fit of the CPQPE to measure students’ cognitive processes variables in physical education context with Estonian students. The results of the EFA for the original (Papaioannou, 1994) two learning oriented subscales (Teacher-Initiated Learning Orientation and Students´ Learning Orientation) from the LAPOPECQ indicated the existence of a four-factor structure. Cronbach alpha scores indicated good internal reliability for the four factors ranging from .68 to .81. The goodness of fit indexes of CFA confirmed the four-factor structure of the model. Thus, according to the context of the items, the new factors were labeled. The first factor that emerged from the teacher initiated learning orientation subscale of LAPOPECQ seemed to measure teachers´ satisfaction with students’ development. The second focused on teachers being sure about the students’ performance improvement as a result of provided knowledge. From the student learning orientation subscale, one factor that emerged focused on the students´ satisfaction of
teaching methods, and the other, on the students’ wish to make an effort and feel enjoyment. It is interesting to note that precisely these items of the subscales learning orientation and teacher’s initiated learning orientation, which were split across two factors in the study of Goudas and Biddle (1994), separately formed four factors in this study. The emerged four-factor structure allowed us to study the perception of students’ learning climate more differentially. One of the reasons why the factorial structure of learning climate resulted different from the original version of the LAPOPECQ may be that Greek students are taught physical education in coeducational classes, while Estonian girls and boys are taught separately from the fifth grade on. So, these different conditions may affect the perception of the learning climate. Also, the impact of cultural background cannot be excluded.

Initially, six new items were designed to measure the students’ physical activity intention. After evaluating the context of the items with the two sport psychology experts, two of the items were excluded from the subsequent analyses. Two of the remaining four directly measured physical activity intention, as they ask about plans for after graduation (After graduation I would like to take part of the sport club trainings, After graduation I would like to be physically active). The remaining two questions are related to intentions (I’m interested in developing my physical fitness, Outside from the physical education lessons I like to do sport), as they measure the attitude toward physical activity. Strong attitudes are said to be relatively stable over time, to be resistant to persuasion, and to predict manifest behavior (Ajzen, 2001).

The EFA showed that all four intention items emerged in one factor with strong factor loadings (over .70). The measurement errors for every item were quite low, under .40, and internal consistency coefficient (Cronbach alpha) for the subscale was .81, which can be considered good. Also, CFA indexes of fit confirmed the adequate fit of the intention scale. In the study of Hagger et al. (2001), where three items were used to measure intention all
measurement errors were over .55 and the scale also exhibited adequate internal consistency (Cronbach’s alpha = .77). In the study of Escarti and Guiterrez (2001), the internal consistency for the five-item intention questionnaire was .91, while no EFA or CFA was presented. Also in the study with Canadian school children (Mummery, Spence, & Hudec, 2000) to predict physical activity intention, where four items were used, no EFA and CFA were presented (Cronbach’s alpha = .91). Therefore it’s impossible to compare the fit indexes of the factor analyses with the previous results, but the validity and reliability from the present study supported the use of these items to measure physical activity intention. However, the content and criterion related validity of this subscale merit future discussion and investigation.

Up to date several structural models have formed with predictors of intention such as attitudes, perceived behavioral control, subjective norms, intrinsic and external motivation (Mummery, Spence, & Hudec, 2000; Escarti & Guiterrez, 2001; Hagger et al., 2001; Hagger et al., 2002). The effect of students’ task orientation – which is to a great extent the result of the perceived learning/mastery oriented environment – on intention to be physically active has been shown in the models presented by Biddle, Soos and Chatzisarantis (1999) and Lintunen, Valkonen, Leskinen and Biddle (1999). The model of our study allows one to view how the cognitive variables of teaching-learning processes (Solmon & Lee, 1997) are related with the students’ perception of the four different aspects of learning oriented environment and the physical activity intention.

The results of this study support our hypothesis, that all observed cognitive processes may have roles as mediators, between learning oriented environment and student’s physical activity intention only to some extent. In the initial path model the effects of attention-concentration and confidence-efficacy turned out to be non-significant and, therefore, were eliminated from future analysis. From the cognitive processes, the self-regulation and use of
strategies proved to be the most important mediators. Self-regulatory systems refer to how individuals control and regulate themselves and pursue their goals. The focus on items of the self-regulation subscale allows us to draw parallel with items designed to measure intrinsic motivation on the base of self-determination theory (Ryan & Conell, 1989). The role of the self-regulation as an important mediator is consistent with the results where effects of several dispositional conditions on intention were also mediated by intrinsic motivation (Escarti & Guiterrez, 2001; Hagger et al., 2002).

The items from the subscale of use of strategies characterize how students use learning strategies to master a new skill. According to the presented path model, the students’ use of strategies appeared to play an essential mediating role beyond self-regulation. It seems noticeable because all models of physical activity intention constructed so far have not indicated to the mediator role of this domain. However, Solmon and Boone (1993) found in their study a positive association between learning orientation and the use of adaptive learning strategies.

Of the four learning orientation subscales, the effort-enjoyment subscale was only one that had a direct effect on physical activity intention. Considering, also, it’s indirect effects on intention via self-regulation, willingness to engage and use of strategies then students’ perception of learning environment as enjoyable and directed to make an effort may be estimated as a more important component of dispositional factors having the effect on physical activity intention. The students wish to make an effort and feel enjoyment in physical activity may, therefore, influence her/his intention to be physically active in the future. This statement confirms the findings of several authors. Biddle and Chatzisarantis (1999) reported that positive feeling derived from physical education activities are likely to be the best determinant of intentions, at least in the short term. Enjoyment can stem from feelings of autonomy and personal control and from being optimally challenged. In addition,
the authors noted that enjoyment is related to wanting to try hard, and to learn and co-operate to improve. Escarti and Guitierrez (2001) also found direct effect from learning orientation to intention to practice, while it was influenced by the pursuit of progress by pupils. Therefore, physical education lessons should aim to be purposeful, yet enjoyable.

The path model of intention, comprising the role of teacher behavior in creating the learning environment, is consistent with the statement reported earlier by Ommundsen and Bar-Eli (1999) that the physical education teacher may play an important role in shaping the teaching-learning atmosphere and thereby affect students’ cognition. Furthermore, they noted that the teacher creates an environment that influences pupils’ perceptions and cognitions in such a way that important outcomes of physical education may be realized. The effect of the learning environment perceived by students as teachers’ satisfaction of their learning on intention was mediated by self regulation, which had a slightly stronger influence than perceived teachers’ behavior connected with providing the knowledge of their performance and mediators via the use of strategies. One of the most important findings from the proposed model in comparison with models presented earlier is the emergence of the use of strategies as a mediator between the perceived learning oriented environment and intention.

In terms of practical recommendation arising from this study, PE teachers in promotion of physical activity among children may view their initiating learning climate from two different aspects. One is connected with students’ perception that teachers are satisfied with their learning, and the other that teachers provide them with the knowledge about their performance. The first has an effect on intention through the students’ perception that their behavior is more self-regulated, and the second has an effect on intention through the use of learning strategies.

One criticism that may be leveled at the present path model is that it accounts only for 23% of the variance in intention. Although the results of structural and content validity
revealed to be acceptable, further investigation with respect to criterion-related validity is needed.

Conclusion

The cognitive Processes Questionnaire in Physical Education (CPQPE) is a valid and reliable tool to measure students’ cognitive variables in physical education within different cultural contexts. The most important roles in relation to the observed cognitive variables as mediators between the perceived leaning climate and physical activity intention belonged to self-regulation, use of strategies and willingness to engage. The perception of learning climate as being oriented to make an effort and feel enjoyment had a direct effect on intention and an indirect effect via the mediators of self-regulation, willingness to engage and use of strategies.
References


### TABLE I

*Goodness-of-fit statistics for confirmatory analysis of CPQPE*

<table>
<thead>
<tr>
<th>Models</th>
<th>NFI</th>
<th>NNFI</th>
<th>CFI</th>
<th>AGFI</th>
<th>GFI</th>
<th>RMR</th>
<th>RMSEA Interval</th>
<th>( \chi^2 )/df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>.71</td>
<td>.87</td>
<td>.88</td>
<td>.95</td>
<td>.96</td>
<td>.03</td>
<td>.02</td>
<td>.015 - .019</td>
</tr>
<tr>
<td>Model 2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.84</td>
<td>.86</td>
<td>.06</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note.* Model 1 = confirmatory factor analysis indexes of fit of this study; Model 2 = confirmatory factor analysis indexes of fit reported by Solmon and Lee (1997); NFI = normed fit index; NNFI = non-normed fit index; CFI = comparative fit index; AGF = adjusted goodness of fit index; GFI = goodness of fit index; RMR = root mean square residual; RMSEA = root mean square error of approximation.
### TABLE II

**Confirmatory factor analysis indexes of fit of the two-factor structure and four-factor structure of LAPOPECQ**

<table>
<thead>
<tr>
<th>Models</th>
<th>NFI</th>
<th>NNFI</th>
<th>CFI</th>
<th>AGFI</th>
<th>GFI</th>
<th>RMSR</th>
<th>RMSEA</th>
<th>90% Confidence interval for RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model1</td>
<td>.63</td>
<td>.55</td>
<td>.63</td>
<td>.58</td>
<td>.71</td>
<td>.19</td>
<td>.16</td>
<td>.15 - .16</td>
</tr>
<tr>
<td>Model2</td>
<td>.91</td>
<td>.91</td>
<td>.93</td>
<td>.88</td>
<td>.93</td>
<td>.082</td>
<td>.048</td>
<td>.036 - .060</td>
</tr>
</tbody>
</table>

*Note. Model 1 = confirmatory factor analysis of two factor structure; Model 2 = confirmatory factor analysis of four-factor structure.*
**TABLE III**

*Principal component factor analysis (varimax rotation) for learning orientation subscales of LAPOPECQ*

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The PE teacher is most satisfied when every student learns something new. TO1</td>
<td></td>
<td></td>
<td></td>
<td>.658</td>
</tr>
<tr>
<td>The PE teacher looks completely satisfied when students are improving after trying hard. TO2</td>
<td></td>
<td></td>
<td></td>
<td>.815</td>
</tr>
<tr>
<td>The PE teacher is completely satisfied when every student’s skills are improving. TO5</td>
<td></td>
<td></td>
<td></td>
<td>.790</td>
</tr>
<tr>
<td>The PE teacher insists that students’ mistakes are part of learning. TO3</td>
<td></td>
<td></td>
<td></td>
<td>.719</td>
</tr>
<tr>
<td>The PE teacher makes sure that I understand how to perform each new skill before the class moves on to learning other skills. TO4</td>
<td></td>
<td></td>
<td></td>
<td>.735</td>
</tr>
<tr>
<td>The PE teacher pays special attention to whether my skills are improving. TO6</td>
<td></td>
<td></td>
<td></td>
<td>.726</td>
</tr>
<tr>
<td>The way the lesson is taught helps me learn how to exercise by myself. LO1</td>
<td></td>
<td></td>
<td></td>
<td>.645</td>
</tr>
<tr>
<td>The way the lesson is taught helps me learn how to PE to improve my health. LO2</td>
<td></td>
<td></td>
<td></td>
<td>.766</td>
</tr>
<tr>
<td>I feel very satisfied when I learn something new. LO3</td>
<td></td>
<td></td>
<td></td>
<td>.891</td>
</tr>
</tbody>
</table>
Table 3 (continued).

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel very satisfied when I learn new skills and games. LO4</td>
<td>.886</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoy trying my best to learn a skill. LO5</td>
<td></td>
<td>.783</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I learn something enjoyable. LO6</td>
<td></td>
<td></td>
<td>.740</td>
<td></td>
</tr>
<tr>
<td>What I learn makes me want to practice more. LO7</td>
<td></td>
<td></td>
<td></td>
<td>.709</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>3.89</td>
<td>2.34</td>
<td>1.24</td>
<td>1.03</td>
</tr>
<tr>
<td>Percent of variance</td>
<td>30</td>
<td>18</td>
<td>9.5</td>
<td>7.9</td>
</tr>
</tbody>
</table>
**Figure Captions**

**Figure 1.** Confirmatory factor analysis model for the learning climate.

*Note.* T1 = teachers’ satisfaction with students learning; T2 = teacher initiated knowledge of performance improvement; L1 = students’ satisfaction with teaching methods, L2 = students’ effort/enjoyment.

**Figure 2.** Confirmatory factor analysis measurement model for the intention items.

*Note:* Item 1 = I’m interested in developing my physical fitness; Item 2 = After graduation I would like to take part of the sport club trainings; Item 3 = After graduation I would like to be physically active; Item 4 = Outside from the physical education lessons I like to do sport.

**Figure 3.** A path model of intention from self-regulation, willingness to engage and use of strategies.

*Note:* SR = self-regulation, ST = use of strategies; WEN = willingness to engage; INTENT = physical activity intention; T1 = teachers’ satisfaction with students learning; T2 = teacher initiated knowledge of performance improvement; L1 = students’ satisfaction with teaching methods, L2 = students’ effort/enjoyment.
Figure 1. Confirmatory factor analysis model for the learning climate.

Note. T1 = teachers’ satisfaction with students learning; T2 = teacher initiated knowledge of performance improvement; L1 = students’ satisfaction with teaching methods, L2 = students’ effort/enjoyment.
Figure 2. Confirmatory factor analysis measurement model for the intention items.

Note: Item 1 = I’m interested in developing my physical fitness; Item 2 = After graduation I would like to take part of the sport club trainings; Item 3 = After graduation I would like to be physically active; Item 4 = Outside from the physical education lessons I like to do sport.
Figure 3. A path model of intention from self-regulation, willingness to engage and use of strategies.

Note: SR = self-regulation, ST = use of strategies; WEN = willingness to engage; INTENT = physical activity intention; T1 = teachers’ satisfaction with students learning; T2 = teacher initiated knowledge of performance improvement; L1 = students’ satisfaction with teaching methods; L2 = students’ effort/enjoyment.