Motivational Climate in Physical Education, Achievement Motivation and Physical Activity: A Latent Interaction Model

Acknowledgements. This research was supported by grants from the Fonds de recherche du Québec – Société et Culture. The authors wish to thank the students who participated in this study, as well as their PE teachers and school principals.

Citation: Girard, S., St-Amand, J., & Chouinard, R. (2019). Motivational Climate in Physical Education, Achievement Motivation and Physical Activity: A Latent Interaction Model. *Journal of Teaching in Physical Education*. https://doi.org/10.1123/jtpe.2018-0163

Abstract

Purpose: This paper aims to assess if high school students' leisure time physical activity (LTPA) is predicted by their perception of the motivational climate, their perceived competence and their achievement goals in physical education (PE), and if these variables interact with each other.

Method: A sample of 843 high school students completed self-reported questionnaires in the middle and the end of the school year. The data were analyzed by structural equation modeling (SEM) and latent moderated structural equations (LMS).

Results: LTPA was positively predicted by students' performance-approach goals and perceived competence in PE, and by the interaction between their perceived competence and their adoption of mastery goals.

Discussion/Conclusion: Only individual variables in PE were related to LTPA. The significant interaction effect between students' mastery goals and perceived competence in PE suggests that teachers need to foster students' perceptions of competence. We, therefore, discuss the scope of the results with regards to pedagogical practices.

Keywords: *achievement goals, perceived competence, leisure time, high school, structural equation modeling, LMS*

Introduction

The quality of youth's physical fitness has decreased considerably in recent decades (Tremblay et al., 2010; ParticipACTION, 2016) and is partly explained by their lack of physical activity (PA). In fact, researchers agree that teenagers are not very active and suggest that many school-aged children and youth tend to adopt inactive lifestyles (e.g., watching television, chatting or playing video games; Colley et al., 2011; Kirk, Penney, & Langille, 2009; Matthews et al., 2008; ParticipACTION, 2016). For example, ParticipACTION Report Card on Physical Activity for Children and Youth indicated that only 5% of adolescents meet the recommended guidelines.

This level of inactivity has physical and psychological consequences. For instance, childhood obesity has tripled in the past 30 years in the U.S. (Fryar, Carroll, & Ogden, 2014). In Canada, 17% of youth under 18 years of age are overweight, and 9% are obese (Shields & Tremblay, 2010). Obesity being associated with insufficient PA (Starkoff et al., 2014), inactive adolescents are a population at risk (Centre de Recherche et d'Expertise en Évaluation, 2014). As Hills, Dengel, and Rubans (2015, p. 368) pointed out: "Poor physical and mental health, including metabolic and cardiovascular problems, are seen at progressively younger ages, and the systematic decline in school PA has contributed to this trend." Because "one of the major challenges of high school is to provide teenagers with ways to make PA more important in their daily lives" [1] (Ministère de l'Éducation, du Loisir et du Sport, 2011a, p. 469), physical education (PE) remains one of the best opportunities for students to be physically active at school (Brusseau &

[1]Free translation by the authors.

Kulinna, 2015), and to help them develop life-long healthy habits in their leisure time (Sproule, Wang, Morgan, McNeill, & McMorris, 2007).

Over the years, many researchers have emphasized the decline of teenagers' motivation for PA. Scientists have developed many theories to explain motivation to engage in sport or PA, such as PE (Gillet & Vallerand, 2016; Hagger & Chatzisarantis, 2016; Standage & Ryan, 2012; Wigfield et al., 2015). In light of these theories, many contextual and individual variables affect students' motivation in PE. More specifically, the prevailing motivational climate in PE is reported to play a critical role regarding goals pursued by students and their involvement in leisure time physical activity (LTPA; Harwood, Keegan, Smith, & Raine, 2015).

Currently-available data indicate that decreased motivation and engagement in PE are particularly important during the first years of high school (Comité Scientifique de Kino-Québec, 2012; Ntoumanis, Barkoukis, & Thøgersen-Ntoumani, 2009; Ullrich-French & Cox, 2013). In contrast to primary schools, social comparison between students and competition are more present in high school PE (Comité Scientifique de Kino-Québec, 2012). Therefore, less able students are given fewer opportunities to improve their skills. This pedagogical context provides incentives to students that it is more important to "be the best" than to "do their best." It might explain why high school students perceive that their PE teachers promote performance and competition more often than their primary school PE teachers (Baril et al., 2013; Ntoumanis et al., 2009; Spray, Warburton, & Stebbings, 2013) to the detriment of achieving personal progress and pursuing mastery of tasks (Ntoumanis et al., 2009; Spray et al., 2013; Ullrich-French & Cox, 2013). In light of these observations, the achievement goal theory provides a relevant framework for more in-depth analysis of students' motivational processes in PE.

Specifically, the present paper seeks to better understand the links between motivational climate in PE classes, students' perceived competence and achievement goals in PE, and their LTPA.

Theoretical Framework: Achievement Goal Theory

Achievement goal theory recognizes the influence of environment (motivational climate) on people's motivational processes (achievement goals) and behaviour (Ames, 1992; Elliot, 1999). Depending on their teachers' educational practices like definition of success and failure, grouping of students, types of activities, interactions between and with students, evaluation criteria and quality of feedback, students can perceive motivational climate as being focused mainly on mastery or on performance. In fact, they are more likely to perceive motivational climate as mastery-oriented (i.e., oriented toward improvement and skills development) if their PE teachers promote personal progress, effort, perseverance when faced with challenging tasks, respect towards students' abilities, learning processes, and cooperation. In contrast, students might perceive motivational climate as performance-oriented (i.e., oriented toward comparative performance) if their PE teachers adopt normative standards to evaluate them, value students with superior skills and compare them with one another (Ames, 1992; Elliot, 1999; Papaioannou, Zourbanos, Krommidas, & Ampatzoglou, 2012; Roberts, 2012).

Elliot (1999, p. 174) defined achievement goals as "the cognitive representations that focus individuals on a competence-based possibility." Therefore, achievement goals adopted by students are determined by their perceived competence in PE. Consistent with this perspective, research findings underscore that students' perceived competence is of paramount importance for their involvement in a given field (e.g., PE, sport or PA; Brazendale et al., 2015; Cairney et al., 2012; Papaioannou, Bebetsos, Theodorakis,

Christodoulidis, & Kouli, 2006). When people apply self-reference criteria such as amount of personal progress and improvement or degree of success on tasks to evaluate their competence, they tend to adopt mastery goals. Individuals pursuing these types of goals want to master tasks, learn new things and improve their abilities. They will engage in challenging tasks and will be satisfied to persevere and put effort into them (Elliot, 1999; Papaioannou et al., 2012; Roberts, 2012). When individuals assess their competence by comparing themselves to others or to normative standards, they are likely to adopt performance goals. If they feel they can outperform others or surpass the standard, they tend to pursue performance-approach goals. For them, the expectation of success is positive and oriented towards success. In contrast, if individuals do not feel competent in comparison to others, they might adopt performance-avoidance goals. With the expectation of success being negative and oriented towards failure, they will try to preserve their self-esteem by adopting avoidance strategies (Elliot, 1999; Papaioannou et al., 2012; Roberts, 2012). As it is frequently the case, the present study considers the trichotomous model, which consists of three types of achievement goals, but other taxonomies exist, varying from two to six goals (see Elliot, 1999). Young high school students seem to have difficulty understanding some of these goals (e.g., mastery-avoidance) and, as a result, have little chance of pursuing them in PE (Garn, Ware, & Solmon, 2011). Moreover, a number of researchers question the existence of this category of goals (Papaioannou et al., 2012; Roberts, 2012; Spray et al., 2013). For these reasons, they were not included in the present study.

Even if achievement goal theory considers achievement goals as individual characteristics, students tend to embrace them according to their perception of the motivational climate (Harwood et al., 2015; Papaioannou et al., 2012). Therefore, if

students perceive that their PE teacher focuses on competition, they will tend to adopt performance goals. In the same way, if they perceive that their PE teacher insists on the importance of personal improvement, they will tend to adopt mastery goals.

Studies evaluating relationships between motivational climate in PE and students' LTPA have delivered mixed results. In fact, some have reported no association with a mastery climate (Bryan & Solmon, 2012; Papaioannou, Marsh, & Theodorakis, 2004), while others have observed positive linkage of small magnitude (r = .22 and .24; β = .14; Digelidis, Della, & Papaioannou, 2005; Gråstén & Watt, 2016; Theodosiou & Papaioannou, 2006). Moreover, only one study described a rather minor (r = .13), positive relationship between performance climate and LTPA (Theodosiou & Papaioannou, 2006), while the majority of investigations discerned no significant association between these two variables (Bryan & Solmon, 2012; Digelidis et al., 2005; Gråstén & Watt, 2016; Papaioannou et al., 2004).

As for relationships between achievement goals in PE and LTPA, researchers have noted a positive association (r = .24; β = .05) with students' mastery goals (Digelidis et al., 2005; Papaioannou et al., 2004; Theodosiou & Papaioannou, 2006). However, the results are inconsistent regarding relationships with performance goals (approach and avoidance). A literature review divulged that performance-avoidance goals are not linked to students' LTPA (Papaioannou et al., 2012). However, several researchers considered only two types of goals (mastery and performance) in their studies, and so made no distinction between performance-approach and performance-avoidance goals. This might explain why the relationship between performance goals and students' PA is sometimes significant (r = .12; Marsh et al., 2006) and sometimes non-significant (Digelidis et al., 2005; Gråstén & Watt, 2016; Papaioannou et al., 2006).

The previous results indicate the importance to consider both contextual (climate) and individual variables (achievement motivation) in PE to explain students' LTPA. In this sense, a correlational study examined the relationships between these variables in a sample of 188 teenagers and adults between 16 and 31 years old (Skjesol & Halvari, 2005). In their model, however, these authors conceptualized perceived competence as a consequence of performance (approach and avoidance) goals, so they did not evaluate relationships between these goals and LTPA. Furthermore, as stated earlier, the trichotomous model conceptualizes perceived competence as an antecedent of achievement goals rather than as an outcome (Elliot, 1999; Papaioannou et al., 2012). Another transversal study (Gråstén & Watt, 2016) considered only two types of achievement goals (mastery and performance) and sought to verify these relationships in a sample of younger students, 11 to 16 year olds. Their results showed no significant relationships between students' achievement goals in PE and LTPA engagement. However, the contribution of students' perceived competence was not considered in their model.

Present Study

In light of the foregoing, the inconsistent direct effect results suggest that these variables might interact with each other. As stated by Roberts (2012, p. 17), "an interactionist approach […] may provide a far more complete understanding of the motivation process." Therefore, the aims of the present investigation are two-fold: (a) to assess if students' LTPA at the end of the school year is predicted by their perception of the motivational climate in PE, their perceived competence and their achievement goals in the middle of the school year, and (b) to ascertain if these determinants (motivational

climate, perceived competence, and achievement goals) interact with each other to predict LTPA.

As recommended by Roberts and Papaioannou (2014), the present study considers the contribution of students' achievement goals and perceived motivational climate simultaneously. In regard of the first aim, we hypothesized that only individual variables (achievement goals and perceived competence) will display significant relationships with students' LTPA. More precisely, we anticipate a positive relationship with students' perceived competence in PE and with their adoption of mastery and performance-approach goals.

In regard of the second aim, we hypothesized that students' perception of the motivational climate will interact with their adoption of achievement goals. For example, if students adopt mastery goals and perceive a mastery motivational climate, they might be more physically active in their leisure time. In contrast, if they pursue mastery goals, while perceiving a performance climate, they might be less physically active. We also hypothesized that individual variables could interact with each other. More precisely, students adopting mastery as well as performance-approach goals might lead to a higher level of physical activity in their leisure time. In the same way, students with a high perception of competence and pursuing approach goals (mastery or performance) might also tend to be more physically active.

Method

Participants and Procedure

After receiving approval from the researchers' institutional ethics board, six French public and three French private high schools in Québec (Canada) agreed to participate in this study, for a total of nine schools. Participants and their parents gave

informed consent in writing prior to their enrollment. The sample consisted of 843 high school students (age_{mean} = 13.87, SD = .94), 410 females (age_{mean} = 13.76, SD = .89) and 433 males (age_{mean} = 13.98, SD = .97). Just over half of the participants (58.1%) were born in Canada from Canadian parents. Students whose parents were born outside Canada came from over 80 different countries. Socio-economic status (SES), based on the primary school attended by students, indicated that 18.7% were of low SES, 40.1% average, and 41.2% high.

Participants originated from 46 PE classes (29 classes from public schools and 17 classes from private schools) instructed by 30 different teachers. Among all schools, four different groupings of students were offered: ordinary classes (32%), special classes (5%), non-sporting concentration (32%) and sporting concentration (31%). Ordinary classes consisted of approximately 30 students who chose no concentration for their high school education. Special classes consisted of approximately 15 students with special needs. Non-sporting concentration classes consists of around 20 to 30 students who chose a concentration for their high school education that was not related to sport (e.g., arts, music, languages, international education). Sporting concentration classes consists of around 20 to 30 students who chose a concentration for their high school education that was related to sport (e.g. physical fitness, multisport, cheerleading, football, hockey). Nevertheless, it is important to note that no matter the type of classes or concentration, all students had mandatory PE classes. Moreover, both public and private school PE teachers were required to follow the same physical education program as well as the progression of learning and the learning assessment framework prescribed by the *Ministère de l'Éducation, du Loisir et du Sport* (2010, 2011ab).

Data were collected with two questionnaires containing self-reported items, completed during PE classes at the beginning (February = time period 1) and at the end (May = time period 2) of the last school term. Data were collected on two time-points because we wanted to estimate the predictive value of students' perception of motivational climate and adoption of achievement goals in their PE classes on their LTPA. The first time period occurred in February to make sure that the motivational climate was well established in PE classes. Moreover, because questionnaires were administered during class time, schools principals insisted that they were the shortest as possible, so students would miss as little physical activity time as possible. Therefore, in the first time period, students were questioned about their perception of the motivational climate, their perceived competence and their achievement goals in PE classes. In the second time period, students were only questioned about their LTPA. To pair data, students' were asked to write their name on the questionnaires, but they were assured that the information provided would stay confidential.

Measures

Several scales from different sources were used to measure participants' achievement goals and perceptions of their classroom climate. To assess their reliability, Cronbach's alpha was calculated with the sample of the present study and reported in the next subsections. All scales provided acceptable internal validity ($\alpha \geq .71$). For each item, participants indicated their level of agreement on a 5-point Likert scale (1 = *totally disagree*; 5 = *totally agree*).

Perception of the motivational climate. Two scales from the *Significant Others' Goal Involving Roles in Sport Questionnaire* (Le Bars, Ferron, Maïano, & Gernigon, 2006) measured students' perception of the motivational climate in their PE classes. The

initial items referred to the context of sport so they were adapted to PE (with approval by one of the original authors). The mastery climate scale (α = .89) consisted of five items (e.g., "This year, in my PE classes, my teacher is happy when everyone gets better"). The performance climate scale (α = .73) consisted of four items (e.g., "This year, in my PE classes, my teacher encourages students who are the best").

Perceived competence. Two items **(**α = .76) derived from the *Échelle de Satisfaction des Besoins Fondamentaux en Contexte Sportif* (Gillet, Rosnet, & Vallerand, 2008) measured students' perceived competence (e.g., "This year, in my PE classes, I feel that I am succeeding").

Achievement goals. Three scales from the *Questionnaire Francophone sur les Buts d'Accomplissement dans le Domaine du Sport et de l'Exercice* (QFBASE; Riou et al., 2012) measured students' achievement goals. The scale for mastery goals (α = .87) consisted of three items (e.g., "Usually, in my PE classes, my goal is to progress as much as possible"). The scale for performance-approach goals (α = .89) consisted of three items (e.g., "Usually, in my PE classes, my goal is to be better than the others"). The scale for performance-avoidance goals (α = .71) also consisted of three items (e.g., "Usually, in my PE classes, I try to avoid being less good than others").

Leisure time physical activity. Participants responded to the following question: "In the last three months, how many hours per week were you involved in leisure time physical activity (outside of physical education)?" Despite its limits, measuring PA with only one item is frequent in large scale observational studies. A similar question ("How many hours per week do you play or exercise enough to make you sweat or breathe hard: 0, 1–2, 3–4, 5–7, 8–10 or 11 hours or more per week?") was used in previous studies (Säfvenbom, Haugen, & Bulie, 2014; Sagatun, 2010), and the single item showed

acceptable correlation with other kinds of PA measures (e.g. accelerometer; Sagatun, 2010). A similar way of measuring this variable was also used in a previous study with adult participants (Theodorakis, 1994, p. 156): “The total hours exercise during each of the two months served as the measure of exercise behavior.” This way to assess behavior was also used in a study with children and teenagers (Papaioannou et al., 2004, p. 98), but for a one month period: “actual exercise behavior in the last month.” In the present investigation, the three month period was chosen because it was the time between the two measurements (February to May). Moreover, for students involved in extracurricular activities, recreational or competitive sports, the schedule remained the same during this time period. We chose to ask hours per week instead of hours in total, because we believed that it was easier to estimate hours per week for teenagers. In fact, they only had to calculate how many hours they spent doing these types of activities (e.g. extracurricular, recreational or competitive sports) and estimate how many additional hours they spent doing other physical activities. When we met with the students, we noticed that it was rather easy for them to provide a precise number. Also, the research member responsible for data collection provided help to calculate the scores when asked by students. Even though the dependent variable is not a latent variable, this should not affect the results because SEM analyses allow to use observed variable (one item) as dependent variable.

Data Treatment

Preliminary analysis. Prior to the main analyses, the data were screened for missing values, multicollinearity, and normality. Because a small proportion of data in the overall sample (< 3%) was missing, the expectation–maximization (EM) algorithm

294 available in Mplus was applied (Little & Rubin, 2002). Multicollinearity testing gave
295 acceptable values: tolerance was above .2, and variance inflation factor was below 1
296 (Field, 2009). All variables presented acceptable coefficients of skewness (between -2
297 and +2), but three of them had coefficients of kurtosis over recommended values
298 (mastery climate = 3.85; mastery goals = 3.91; LTPA = 3.88; Tabachnick & Fidell,
299 2012). Non-parametric bivariate correlations (Kendalls' tau) was used to examine
300 associations between study variables because some data were not distributed normally
301 (Field, 2009). These values were then transformed to Pearson's value for interpretation
302 (Kendall, 1955). To address the natural clustering of students within classes, intraclass
303 correlation (ICC) was calculated to determine how much variation of LTPA occurred at
304 the class level (Heck, Thomas & Tabata, 2013; Tabachnick & Fidell, 2012). ICC values
305 higher than .05 are an indication of possible clustering (Heck et al., 2013). In the present
306 sample, the ICC for LTPA was exactly .05. Therefore, data were treated without
307 considering clusters. Finally, means and standard deviations were calculated for each of
308 the variables.

309 **Main analyses.** Regarding the first aim, structural equation modeling was
310 performed using robust maximum likelihood method of estimation because the
311 multivariate normality assumption was not met (Wang & Wang, 2012). To determine if
312 the hypothesized model adequately fits the data, different fit indices were used in this
313 study. The chi-square statistic (χ^2) should not be significant. Nevertheless, with a large
314 sample and non-normally distributed data, chi-square statistic might be significant, even
315 though the model is acceptable (Perry, Nicholls, Clough, & Crust, 2015). Therefore, other
316 fit indices are also considered. The CFI (*comparative fit index*) is not affected by sample
317 size, and its value should be higher than .95. The TLI (*Tucker-Lewis* index) should also

be over .95 in large samples. SRMR (*standardized mean square residual*) value is an absolute adjustment index and should be below .05 (Hu & Bentler, 1999). RMSEA (*root mean square error of approximation*) values under .05 provide good fit. Moreover, to make sure this index is reliable, the confidence interval should be small, and a closeness of fit probability over .50 is recommended (Jöreskog & Sörbom, 1996).

Regarding the second aim, the interaction effects were evaluated using the Latent Moderated Structural Equations approach (LMS; Klein & Moosbrugger, 2000). This distribution analytic approach available in the Mplus software allows for the non-normality of latent variables and their indicators (Marsh, Wen, Nagengast, & Hau, 2012). In contrast with the product indicator approaches, the latent interaction variable has no indicators (Marsh et al., 2012). When testing the interaction effects, adding the numerical integration algorithm ensures that standard errors are robust but prevents the calculation of fit indices, except log-likelihood values (Kelava et al., 2011; Wang & Wang, 2012). Therefore, the log-likelihood ratio test was used to verify if the addition of the interaction effect provides a better fit (Klein & Moosbrugger, 2000; Muthén, 2012). For a detailed procedure, see Girard and Béland (2017) or Maslowsky, Jager, and Hemken (2015). All possible interactions (climate X goals; perceived competence X climate; perceived competence X goals) were tested one by one. The significant interaction effects were then interpreted using the Johnson-Neyman plots (Johnson & Neyman, 1936), now available in Mplus. These plots are more informative than the -1SD/+1SD because they provide information across three standard deviations and because confidence intervals are considered. Therefore, it provides regions of significance that illustrate how the relationship is changing according to the continuous value of the moderator (Clavel, 2015).

Results

Descriptive Statistics

Table 1 enumerates descriptive statistics for each variable included in the model and correlations between them. Means varied from 2.15 (performance climate) to 4.47 (mastery climate), and *SD* varied from .75 (mastery climate) to 1.28 (performance-approach goals). On average, students reported engaging in 5.57 hours of PA per week in their leisure time with *SD* of 5.54. All correlations were significant ($p < .05$), except for the associations between mastery climate, performance-approach (-.03, $p > .05$), and performance-avoidance (.06, $p > .05$) goals. The amplitude of significant correlations varied from weak (.09) to strong (.71). Three variables displayed negative correlations with performance climate: mastery climate (-.48), perceived competence (-.13), and mastery goals (-.25). All other correlations were positive.

Relationships Between Achievement Motivation in PE and LTPA

Fit indices of the hypothesized model were deemed acceptable: $\chi^2_{(169)} = 316.692$, $p = .000$; TLI = .97; CFI = .98; SRMR = .04; RMSEA = .03 [.028-.038, $p = 1$]. Only two predictors reached statistical significance: perceived competence ($\beta = .16$, $p < .05$) and performance-approach goals ($\beta = .21$, $p < .001$). Figure 1 lists standardized estimates. The model without interaction effects explains 9% of the variance of LTPA.

Interaction Effects

Only one interaction (perceived competence X mastery goals) reached statistical significance ($\beta = .07$, $p < .05$) to predict students' LTPA. Figure 2 lists standardized estimates. The log-likelihood ratio test was significant ($D = 6{,}102_{(1)}$, $p < .05$), indicating that the fit of the model with the latent interaction was better than the previous one (Satorra, 2000; Satorra & Bentler, 2010). Figure 3 illustrates that the adjusted effect of

pursuing mastery goals on students' LTPA is significant only for students who score 1.5 standard deviations above the average level of perceived competence. In other words, the more students feel competent, the more and more strongly their adoption of mastery goals will predict their LTPA. The interaction effect accounted for an additional 4% of variance. In sum, the final model explained 13% of students' LTPA variance.

Discussion

Grounded in achievement goal theory, the purposes of the current study were to verify which contextual (motivational climate) and individual (perceived competence, achievement goals) variables in PE predicted students' LTPA, and to explore if these variables interacted with each other. In sum, when both types of variables were considered simultaneously, it was the individual variables and their interaction that predicted students' LTPA.

The fact that students' pursuit of performance-approach in PE is positively related to their LTPA is in line with previous research results (Marsh et al., 2006). It is not surprising that high school students who are confident in their capacity to surpass their classmates in PE reported being more physically active in their leisure time. Being oriented towards and experiencing success in their PE classes might explain why these students are willing to participate in similar activities in their free time. Regarding the pursuit of performance-avoidance goals, it was plausible to think that students doubting their abilities in PE and trying to preserve their self-esteem by adopting avoidance strategies might tend to be less physically active, especially in their free time when they are not obliged to do so. Nevertheless, these two constructs were not significantly associated, which is congruent with the results of Papaioannou and colleagues' (2012) literature review.

It is worth mentioning that achievement goals are not mutually exclusive, meaning that individuals can be oriented towards multiple goals at the same time. In this sense, previous studies reported that pursuing performance-approach goals could lead students to adopt performance-avoidance goals simultaneously, but not the reverse (Duda, 2005; Law, Elliot, & Murayama, 2012; Senko, Hulleman, & Harackiewicz, 2011). Therefore, encouraging competition between students can always, at one time or another, make them adopt avoidance goals. Moreover, Murayama and Elliot (2012) reported that a competitive environment prompts the adoption of performance-approach goals, as well as performance-avoidance goals. If the first kind of goals is positively associated with performance, the latter is not. This is important for physical educators who adhere to the "popular belief" that adding a notion of competition in PE classes is necessary to foster students' motivation. In this regard, it would be preferable to decrease peer-rivalry in favor of creating an environment where students encourage each other to do their best while respecting each pupil's abilities, especially because adolescents highly value their peers' opinions (Horn & Butt, 2014).

Before adding the interaction in the model, the only other significant predictor of LTPA was students' perceived competence. The observed positive relationship between these two variables is in line with previous research (Brazendale et al., 2015; Cairney et al., 2012; Papaioannou et al., 2006). That is, fostering students' competence in PE could lead them to increase their PA practice in their spare time. This seems to be particularly true if students are mastery oriented. Indeed, the significant interaction observed between students' perceived competence and adoption of mastery goals indicated that students' who want to progress and improve in PE will tend to be more physically active in their free time, but only when they also have strong feelings of competence. Although the

direct relationship between the adoption of mastery goals and students' leisure-time was not significant, the adoption of these goals are also beneficial for students in other manners. For example, previous research reported that students who pursued mastery goals in PE valued effort, felt more enjoyment (Marsh et al., 2006), had a higher self-esteem, sought easier for help and used less self-handicapping strategies (Papaioannou et al., 2012).

In light of the above and considering that the perception of performance motivational climate is negatively related to students' perceived competence and mastery goals, the establishment of a performance climate in PE seems questionable and may be detrimental to their LTPA. On the other hand, the perception of a mastery climate was positively associated with these two variables. This suggests that promoting a mastery motivational climate could be beneficial for students' perception of competence. The results of a recent literature review support this view (Harwood et al., 2015).

Limitations and Future Research Avenues

Despite its contribution, this study has limitations. First, causality cannot be inferred between variables. Experimental studies with a longitudinal design would provide better interpretation of the results. Moreover, the omission of collecting all variables at both time-points weakens the generalizations that can be made from the results. Second, it is necessary to remind readers that the present investigation was conducted in schools where PE classes are mandatory, which might affect students' perceptions and motivation. Studies considering contexts where PE classes are optional could contribute to better generalization of the results. Third, only self-reported data were used. Objective measures (e.g. accelerometer) would provide better precision in regard of the "true" quantity of physical activity. As well, observation of the class motivational

climate would provide an objective perspective of what is really done by the teacher. Nevertheless, the motivational climate can be interpreted differently by students depending on their own expectations and their previous personal experiences (Maehr, 1984) and, therefore, affect their cognitions, behaviours and performance unequally (Fontayne & Bohuon, 2012). For these reasons, we chose to focus on students' perceptions in the present investigation. Finally, when trying to predict specific behaviour of human participants, it can be expected that only a low proportion of variance will be explained by study variables (Brazendale et al., 2015). Therefore, we did not expect the model to account for much of the LTPA variance; the final structural model explained only 13% of high school students' LTPA. Several other factors certainly influence the amount of time youth spend on physical activity in their free time (e.g., access to sports facilities, family values, parental support, etc.). That said, the wording of the items in the questionnaire directs participants to perceptions of competence and the LTPA in the same school year. The effects may be cumulative and the explained variance may be larger over the long term. Also, the specific goals pursued in PE class were measured, not the goals pursued during physical activities in general, which certainly had an effect on the explained variance. The effect of specific goals on broader goals should now be examined. Furthermore, in this study we have taken into account a lot of students' perceptions of their environment to explain a number of things. However, several elements at the cognitive or affective level could have been identified, or could be identified later to model these relationships. Nevertheless, our results add to the body of evidence that achievement goal theory provides an appropriate framework to study relationships between the motivational PE context, students' motivational processes and LTPA, and contribute to improvement of PE high school teachers' pedagogical practices.

Implications for Practice and Conclusion

Teachers must be careful when establishing a performance motivational climate in PE because it could promote the adoption of both types of performance goals (Murayama & Elliot, 2012). Furthermore, encouraging superior skills and competition, praising high grades and the importance of outperforming classmates, blaming errors and comparing students during the evaluation process are all pedagogical practices that are at risk of being detrimental to students' perceived competence and pursuit of mastery goals. In contrast, to increase teenagers' LTPA, we recommend that high school teachers foster their students' sense of competence in PE. To do so, they should avoid peer comparison. Instead, they could use students' self-assessment and allow them to self-evaluate in a confidential manner (e.g., in writing rather than out loud). Moreover, providing equitable positive feedback, highlighting and reinforcing students' personal improvement, offering different opportunities for practice, providing each student with occasions to engage in challenges adapted to their individual capacities, emphasizing the importance of attaining personal objectives, forming heterogeneous teams according to students' skill levels, and differentiating the pace of teaching could also contribute to sustain students' perceived competence (Braithwaite et al., 2011; Ekkekakis & Backhouse, 2014; Horn & Butt, 2014). Finally, in a practical way, it is plausible to argue that when PE teachers promote personal progress in respect to each student's capacities, value learning processes, recognize that errors are inherent in the learning process, and acknowledge that there is more than one way to learn, they create an environment favorable to sustain students' motivation.

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Table 1

Descriptive statistics (means and standard deviations) and Pearson correlations between all study variables

Variables	1	2	3	4	5	6	Means (*SD*)
1. LTPA (range 0-33)							5.57 (5.54)
2. Mastery climate	.11**						4.47 (.75)
3. Performance climate	.09*	-.48**					2.15 (.85)
4. Perceived competence	.26**	.52**	-.13**				3.70 (.76)
5. Mastery goals	.23**	.59**	-.25**	.71**			4.46 (.82)
6. Performance-approach goals	.28**	-.03	.37**	.25**	.14**		2.53 (1.28)
7. Performance-avoidance goals	.13**	.06	.11**	.19**	.22**	.50**	3.07 (1.14)

Note. $^{**}p < .01$ $^{*}p < .05$; LTPA = leisure time physical activity

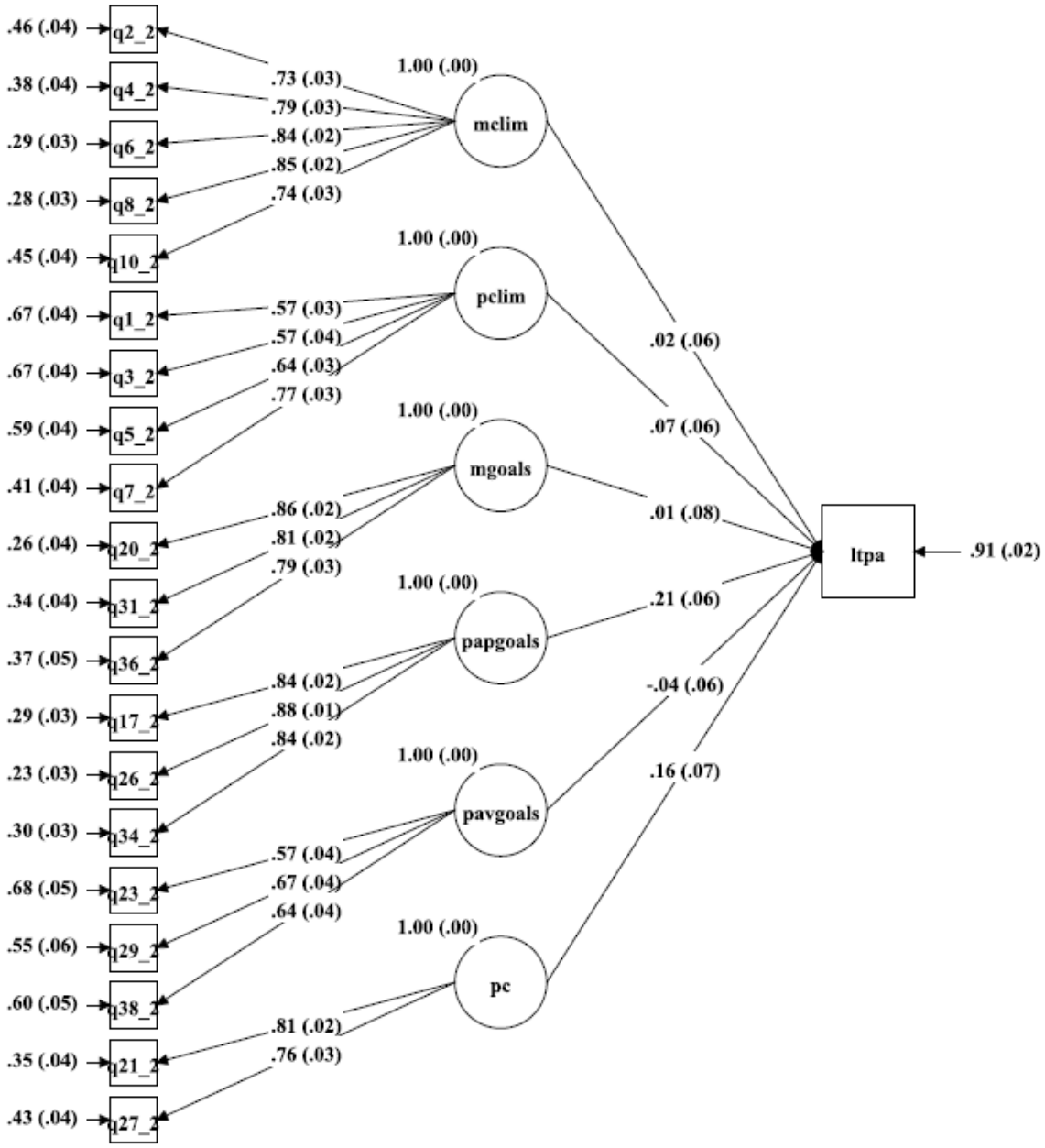

Figure 1. The structural model (mclim = mastery climate; pclim = performance climate; mgoals = mastery goals; papgoals = performance-approach goals; pavgoals = performance-avoidance goals; pc = perceived competence; LTPA = leisure time physical activity)

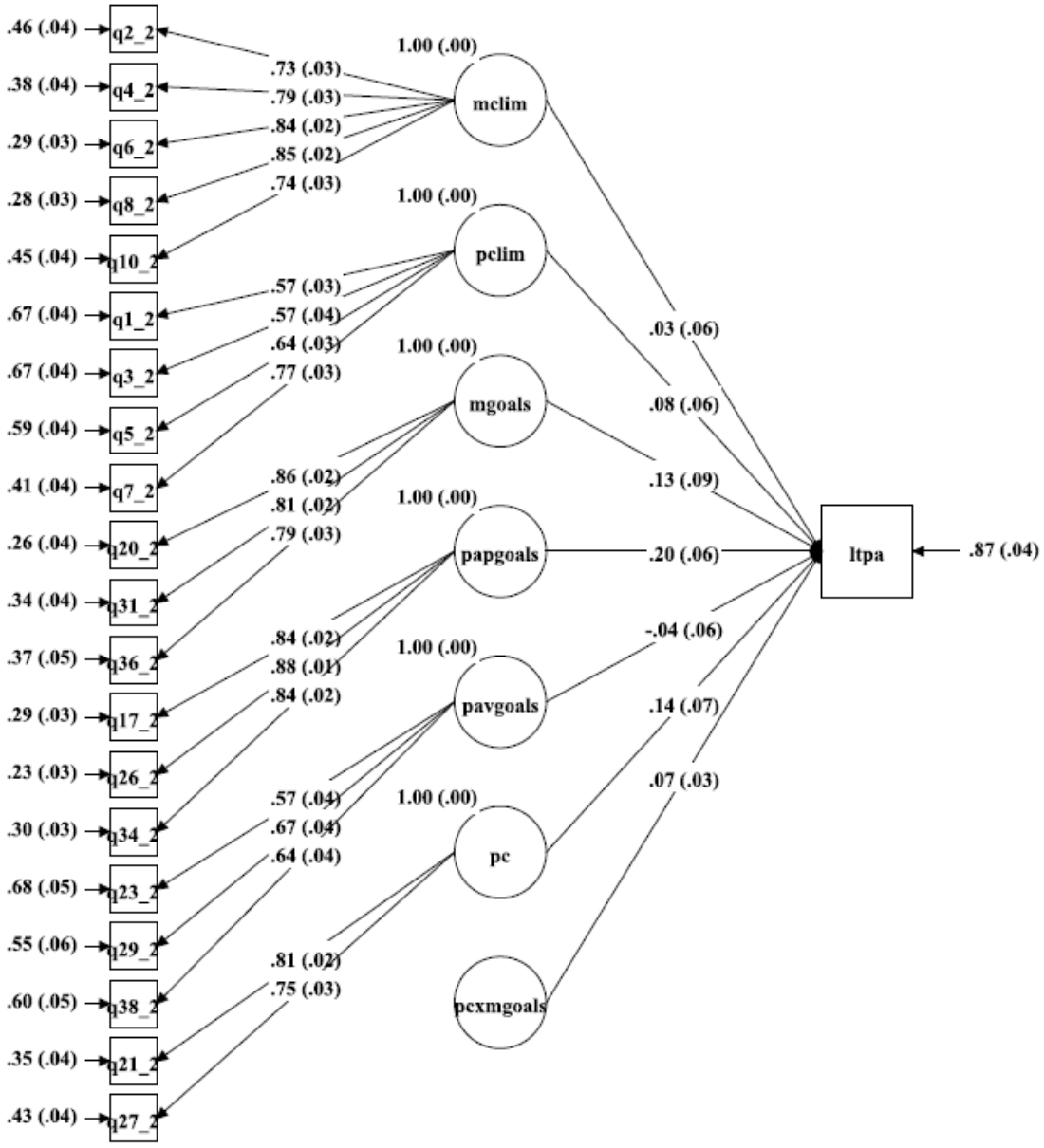

Figure 2. The interaction model (mclim = mastery climate; pclim = performance climate; mgoals = mastery goals; papgoals = performance-approach goals; pavgoals = performance-avoidance goals; pc = perceived competence; pcxmgoals = interaction between PC and Mgoals; LTPA = leisure time physical activity)

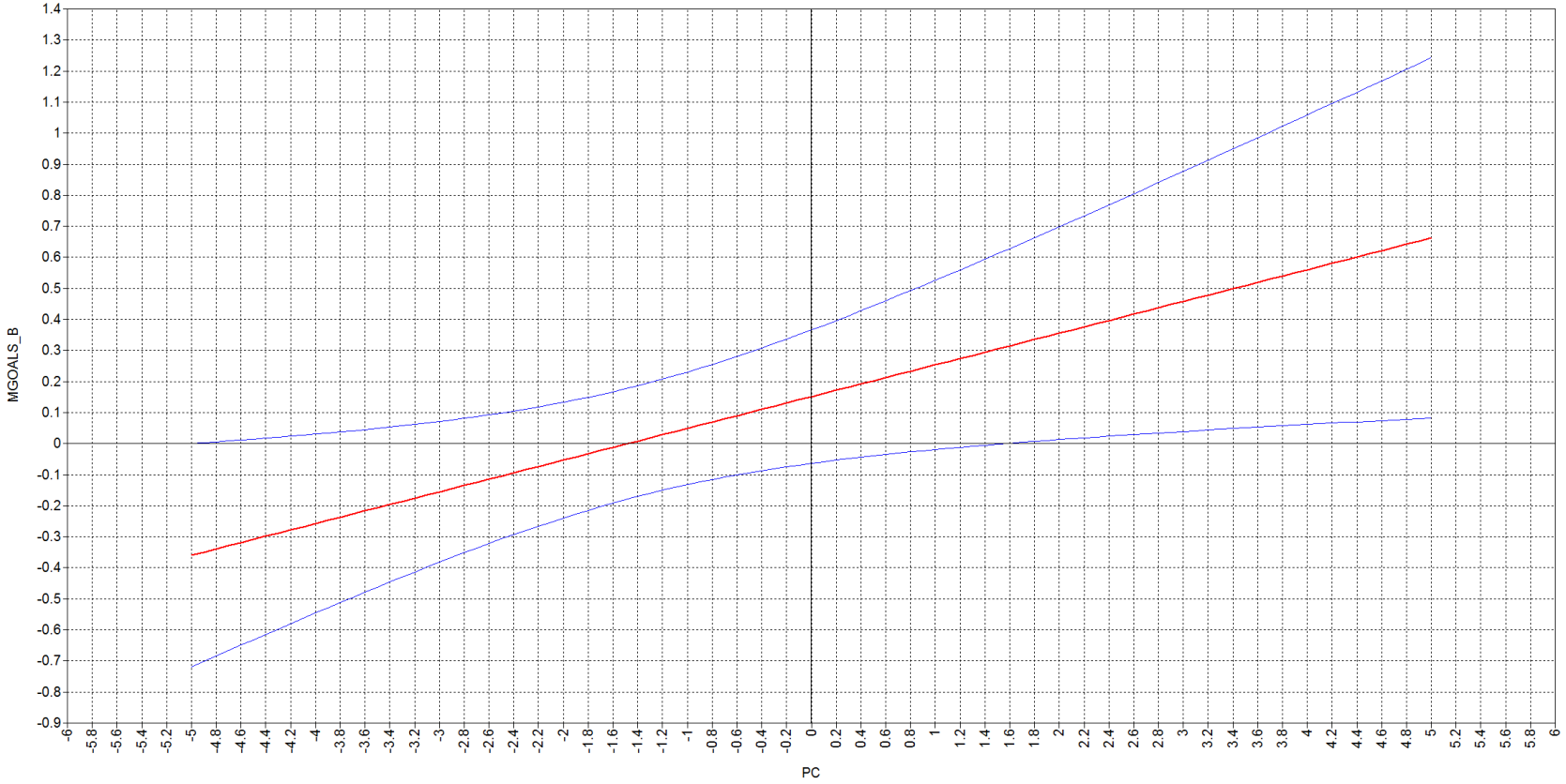

Figure 3. Interaction effect between mastery goals (MGOALS_B) and perceived competence (PC) to predict leisure-time physical activity