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**Predicting Physical Activity Intention and Behaviour using Achievement Goal Theory: A
Person-Centered Analysis**

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Abstract

The purpose of the current study was to identify the 2 x 2 achievement goals profiles at the intraindividual level using a latent profile analyses (LPA) approach while controlling for the nesting of students within classroom. Additional analyses involving the direct inclusion of predictors and outcomes to the final latent profile solution were also used to examine the relationships between the latent profiles and perceived motivational climate, intention to be physically active and physical activity participation. A sample of 1810 school children aged 14 to 19 years drawn from 79 classes in 13 Singaporean schools took part in the study. Using the latent profile analysis, four distinct motivational profiles could be identified. The results from multinomial logistic regressions showed that profile membership was significantly predicted by perceptions of mastery and performance climate. Finally, the results showed that the four profiles differed significantly in terms of intention to be physically active and physical activity participation.

Keywords: 2 x 2 achievement goals, physical activity, perceived motivational climate, latent profile analysis, multinomial logistic regression, outcomes.

In the past decades, researchers have focused on a social cognitive approach to understand motivation and human behaviours in achievement contexts. Within the social cognitive approach, achievement goal theory (Ames, 1992; Dweck & Leggett, 1988; Elliot, 1997; Nicholls, 1984, 1989) is one of the most popular frameworks in studying achievement motivation, and it has generated much research in sport and exercise psychology. In this approach, researchers typically examine the effects of dispositional goal orientation and perceived motivational climate on various outcomes. Thus, Biddle et al. (Biddle, Wang, Kavussanu, & Spray, 2003) reviewed the correlates of achievement goal orientations in physical activity classes and found 98 studies, published between 1990 and 2000, including a total of 110 independent samples (total $N = 21,076$). In addition, Ntoumanis and Biddle (1999) reviewed 14 studies (total $N = 4484$) on the motivational impact of perceived classroom climates within physical education classes. This clearly illustrates the importance that achievement goal theory has had in research on physical education and physical activity within the last decade.

Achievement Goal Theory

The dichotomous achievement goal theory proposed by Nicholls (1989) and Dweck (1999) focuses on two contrasting and complementary goals, conceptualised as dispositional. The first focuses on self-referenced mastery or learning how to do the task, and is usually labelled “mastery” goal. The second emphasises normative comparison of ability or performance relative to others and is labelled “performance” goal (Pintrich, 2000). Furthermore, variations in these two goal orientations, or tendencies, are thought to be linked to different cognitive, affective, and behavioural outcomes.

In the revised achievement goal framework, Elliot (2005) proposes to separate achievement goals from dispositions. He views achievement goals as “aims” toward which individuals strive, a conceptualisation that is consistent with the “prototypical use of the term in the broader motivational literature, and it affords conceptual precision without, ultimately, sacrificing conceptual breadth” (p. 65). In addition, Elliot et al. (Elliot, 2005; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001) propose to incorporate an approach-avoidance dimension to the mastery-performance distinction of the dichotomous achievement-goal theory, leading to a 2 x 2 conceptualisation of achievement goals.

Mastery-approach goals focus on achieving task-based intrapersonal competence, with objectives related to skill development, mastery of task, and self-improvement. Mastery-avoidance goals focus on avoiding task-based intrapersonal incompetence, aiming to avoid not learning or not completing the task. Performance-approach goals focus on normative competence, with the objective to outperform others, win, or show others that you are better. Performance-avoidance goals focus on avoiding normative incompetence, aiming to avoid losing or performing badly compared to others. Interestingly, the 2 X 2 achievement goal framework does not assume that these goals are mutually exclusive, and recognises that individuals will vary along each of these 2 x 2 dimensions.

Research has showed these four goals predicted different cognitions, affects, and outcomes. Generally, mastery-approach and performance-approach goals contribute to positive affects and consequences, while mastery-avoidance and performance-avoidance goals predict less adaptive outcomes (Elliot & McGregor, 2001; Lochbaum, Podlog, Litchfield, Surles, & Hilliard, 2013; Lochbaum & Gottardy, 2015; McGregor & Elliot, 2002; Rawsthorne & Elliot, 1999; Wang, Biddle, & Elliot, 2007). These achievement goals reflect the personal perspective of motivation (Lau & Nie, 2008).

It is noted that researchers who examined the relationships between 2 X 2 achievement goals and related outcomes adopted variable-centred (multiple regressions, structural equation modeling, etc.) approaches (e.g., Cury, Elliot, Fonseca, & Moller, 2004; Elliot & McGregor, 2001), which describe the average relations among variables observed within the complete sample. However, such variable-centred approaches provide information about the underlying continuous structure of psychological constructs, their stability over time, and their relations with other meaningful variables as they apply to the average person in the sample, but ignore potentially critical differences occurring between various subgroups present in the sample (Morin & Wang, in press).

On the other hand, person-centred approaches aim to identify meaningful subgroups of participants (also called profiles) characterised by different patterns of relationships among the variables under study (e.g., Chen, 2012; Smith, Deemer, Thoman, & Zazworsky, 2014; Zuber, Zibung, & Conzelmann, 2015). In relation to achievement goal theory, a variable-centred approach

may investigate the relations between achievement goals (mastery-performance; approach-avoidance) alone, in combination, or in interaction, and a variety of relevant predictors, correlates and outcomes. However, these relations are assumed to apply to all individuals forming the sample. In contrast, a person-centred approach aims to identify subgroups of participants presenting distinct achievement goals profiles, and then relate these profiles to meaningful covariates (predictors or outcomes). Importantly, we are not arguing that person-centred approaches are inherently “better” than variable-centred approaches. Rather, we argue that person-centred approaches contribute to enrich our understanding of important research questions by providing a complementary, and perhaps more heuristic, perspective focused on inter-individual differences and similarities on a configuration of key constructs of interest, rather than focusing on relations among constructs (e.g., Delbridge, & Fiss, 2013; Morin & Wang, In Press). Conceptually, some researchers (e.g., Ntoumanis & Biddle, 1999; Wang, Liu, Chatzisarantis, & Lim, 2010) have argued that since all the goals may vary within the same person, the variable-centred approach imposes an artificial structure on the observed data, and this may not fit the ‘reality’. Therefore, the use of the person-centred approach may further our understanding of the intraindividual differences in goal profiles and relationships with other variables.

Another limitation of most previous studies is the failure to consider the nesting of students within classroom, even though many of the processes under investigation are assumed to occur within classrooms (e.g., physical education classes) under the influence of a specific teacher shared by all students forming the classroom. The purpose of this study is to address these limitations through the identification of achievement goals profiles using a latent profile analysis (LPA) while controlling for the nesting of students within classrooms. In addition, predictors and outcomes were incorporated to this model to further investigate the relationships between the profiles and perceived motivational climate (predictor), intention to be physically active (outcome) and physical activity (outcome).

Students Perceptions of Classroom Goal Structures

At the classroom level, the learning context is expected to have a direct impact on the adoption of specific goals (Ames, 1992; Nicholls, 1989). The study of perceived goal structures in the classroom thus becomes very important as it directly relates to the adoption of specific achievement

goals by students (Papaioannou, Marsh, & Theodorak, 2004). There are two main types of classroom goal structures derived from achievement goal theory: ‘performance’ (ego-involving) and ‘mastery’ (task-involving) motivational climates (Ames, 1992; Ntoumanis & Biddle, 1999). In performance-oriented classrooms, instructional practices and evaluation procedures are structured to emphasise interpersonal competition, discourage mistakes, and reward normative ability. In mastery-oriented classrooms, instructional practices and evaluation procedures would rather emphasise learning and improvement, effort is rewarded, mistakes are seen as part of learning, and choice is provided for task engagement.

Findings from variable-centred correlational studies (e.g., Ntoumanis & Biddle, 1999; Papaioannou, 1995; Wang et al., 2008) have consistently shown that perceptions of a mastery structure are related to adaptive outcomes, and performance goal structures are linked to maladaptive consequences. A study by Wang et al. (2010) adopted a person-centred approach. Their results showed that subgroups (or profiles) of students presenting different perceptions of the physical education classroom motivational climate, also tended to favour different types of achievement goals. Specifically, they found that differences in perceptions of mastery climates seemed influential in determining mastery goals adoption, and enjoyment. However, it should be noted that this study failed to take into consideration students’ nesting within classes. Similarly, since achievement goals are personal constructs operating at the individual level, it would make more sense to create the subgroups (or profiles) of students to present more distinctive achievement goal profiles, rather than to classify these same individuals based on their perceptions of their classroom motivational climate. This way, the association of perceived motivational climate (predictor) on the adoption of distinct achievement goals profiles can be studied in combination with the impact of achievement goal profiles on intentions to be physically active and involvement in physical activity (outcomes). Recently, Morin and Wang (in press) suggested a method allowing for the integration of predictors and outcomes to a LPA solution that we use in the current study.

The Present Study

The purpose of the current study was to identify subgroups of students with distinct

achievement goal profiles, while controlling for their nesting within classrooms. In addition, a multinomial logistic regression was conducted to examine the relation of classroom climate on profile membership. Finally, outcomes were added to the final latent profile solution to examine the differences in intention to be physically active and physical activity participation among the different profiles. Based on findings from Wang et al. (2007; 2010), the following hypotheses were formulated:

H1: There will be at least four distinct profiles based on the 2 x 2 achievement goals. Three profiles will show high, moderate, and low levels of achievement goals, and one profile will show high mastery goals and low performance goals (Wang et al., 2007).

H2: Different levels of achievement goals will be related to different levels of motivational climate, physical activity intention and participation. Specifically, participants with high achievement approach goals will report high mastery climate, high intention, and physical activity participation, compared to those from the lower achievement goals profiles.

Methods

Participants

A sample of 1810 school students aged 14 to 19 years from 13 schools took part in the study. The students were drawn from 79 intact classes with different Physical Education (PE) teachers (79 different teachers); each class size averaged 20.3 students. This sample included 1407 secondary school students and 403 junior college students; 665 boys and 1145 girls. The students were attending Secondary One level (equivalent to Year 7 in the UK or US system) to Junior College Year Two (equivalent to Year 12 in the UK or US system) in the Singapore school system.

Procedure

Ethical approval was obtained from the university Ethical Review Board. Permission to collect data from the students was obtained from the Ministry of Education and schools' principals. The heads of departments for PE were then contacted to arrange for the administration of the questionnaire. The participants took 15 minutes to complete the questionnaire which was administered by research assistants in quiet classroom settings without the PE teachers being present. Before responding to the questionnaires, students provided informed consent after having been informed of

the nature of the research project, that participating in the study was voluntary, that they could withdraw at any time, and that their confidentiality would be maintained.

Measures

The Achievement Goal in Physical Education Questionnaire (AGPEQ). Students' achievement goal orientation was obtained using the AGPEQ (Wang et al., 2007), which includes four 3-item subscales: mastery-approach (e.g., "I want to learn as much as possible from this PE class"), mastery-avoidance (e.g., "I am often concerned that I may not learn all that there is to learn in this PE class"), performance-approach (e.g., "It is important for me to do better than other students in this PE class"), and performance-avoidance (e.g., "My fear of performing poorly in this PE class is often what motivates me"). A 7-point Likert scale was used (1 = strongly disagree; 7 = strongly agree). Evidence for the reliability and validity of the AGPEQ has been provided by Conroy, Elliot and Hofer (2003) and Wang et al. (2007).

Perceived classroom climate. Students rated the motivational climate of their PE classes using the short version of the Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ; Marsh, Papaioannou, Martin, & Theodorakis, 2006; Papaioannou, 1994). There were seven items measuring mastery climate (e.g., "In my PE class, my PE teacher pays special attention to whether my skills are improving"), and 6-items measuring performance climate (e.g., "In my PE class, my PE teacher praises the students only when they are better than their schoolmates"). Items are rated on a 7-point scale (1 = strongly disagree; 7 = strongly agree). The psychometric properties of the LAPOPECQ have been shown to be satisfactory with Singaporean sample (Sproule, Wang, Morgan, McNeill, & McMorris, 2007).

Intention to exercise during leisure time. Three items were used to measure intention to exercise during leisure time in the next two weeks (Hagger et al., 2007; Wang et al., 2008). The items were developed using guidelines from the theory of planned behaviour (Ajzen, 2003). The students were asked whether they planned and intended to play sport or exercise three times a week for the next two weeks. These items were rated on a 7-point Likert scale (1 = very unlikely; 7 = very likely).

Physical activity. Two weeks after the initial survey, the students were asked to rate their

physical activity participation in the last two weeks. Two items were used. The first item asked the student “Over the last two weeks how often have you exercised for at least 30 minutes per day during your leisure time?” This item was developed through an adaptation of Godin and Shephard’s (1985) Leisure Time Exercise Questionnaire. The second question was “During the last two weeks, how hard did you try to exercise, for at least 30 minutes, three days per week during your leisure time?” This item assessed the intensity of the physical activity. Response to the first item was given on a 7-point scale (1 = Not at all; 7 = Most of the days). Response to the second item was also given on a 7-point scales (1 = didn’t try at all; 7 = tried extremely hard). The mean of the two items was taken as an indication of physical activity participation. The validity and reliability of this measure of physical activity have been supported in previous research (see Hagger et al., 2007).

Data Analysis

Preliminary confirmatory factor analyses (CFA) were conducted to examine the structure of the AGPEQ and LAPOPECQ using EQS for Windows 6.1 (Bentler, 2006). The scale score reliability coefficients (Rhos) of the scales were also computed (Fornell & Larcker, 1981). Descriptive statistics and the latent variable correlations of the main variables were tabulated. To assess the fit of these models to the data, we used Bentler-Bonett normed fit index (NFI), Bentler-Bonett non-normed fit index (NNFI); the comparative fit index (CFI); and the mean square error of approximation (RMSEA) and its 90% confidence intervals to evaluate the adequacy of the CFA models. Values greater than .90 and .95 for the NFI, NNFI, and CFI are considered to indicate adequate and excellent fit to the data, respectively, while values smaller than .08 or .06 for the RMSEA reflects acceptable and excellent model fit (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004, Marsh, Hau, & Grayson, 2005).

For the main analyses, LPA were first conducted using the 2 x 2 achievement goal ratings as profile indicators using Mplus 7.2 (Muthén & Muthén 2014) robust maximum likelihood (MLR) estimator, and Mplus design-based correction for students’ nesting within classrooms (Asparouhov, 2005). Solutions including one to eight profiles were estimated. The number of initial stage random starts was set at 10,000 with the 500 best solutions retained for final stage optimisations. The number

of iterations was set at 1000¹. To guide the selection of the optimal number of profiles in the data, we relied on the Akaike's Information Criterion (AIC), the Constant AIC (CAIC), the Bayesian Information Criterion (BIC), the sample-size adjusted BIC (SSA-BIC), and the Lo-Mendell-Rubin likelihood ratio test (LMR) (e.g., Marsh, Lüdtke, Trautwein, & Morin, 2009; Morin & Wang, in press). For the first four indicators, a lower value suggests better fit. The LMR compares the estimated model (k) with a model that has one class less than the estimated model ($k - 1$). Non-significant p values support the $k-1$ profile model. However these tests remain variations of tests of statistical significance and can still be heavily influenced by sample size so that given a large enough sample, they will tend to support the more complex model (i.e., the one with the most profiles; e.g., Marsh et al., 2009). In these situations, information criteria (AIC, CAIC, BIC, and SSA-BIC) should be graphically presented through "elbow plots" illustrating the gains associated with additional profiles (Morin & Wang, in press; Petras & Masyn, 2010) where the point after which the slope flattens out indicates the optimal number of profiles. Finally, the entropy summarises the classification accuracy, ranging from 0 to 1 with higher value indicating greater accuracy.

Importantly, LPAs present three important characteristics that must be kept in mind when interpreting their results (Morin & Wang, In press). First, LPAs are *typological* and provide a classification system to guide the categorization of individuals into qualitatively and quantitatively distinct subpopulations. Second, this classification system is *prototypical*, meaning that all participants have a probability of membership in all profiles based on their similarity with each latent profile. Third, because conventional indices of absolute fit to the data (e.g., CFI, RMSEA) are not available, LPAs are typically *exploratory*, meaning that the final solution is typically selected based on a comparison of solutions including differing numbers of latent profiles. Although it is possible to devise confirmatory applications of LPAs in areas where theory has advanced enough to provide clear

¹ The variables means were freely estimated in all profiles. Models in which the indicators' variances were also freely estimated in all profiles (e.g., Peugh & Fan, 2013) tended to converge on improper solutions (negative variance estimates, non-positive definite Fisher Information matrix, etc.) or not to converge at all even after multiple attempts (e.g., increasing the random starts or iterations, decreasing the convergence criterion). This suggests the inadequacy of these models (Bauer & Curran, 2003; Chen, Bollen, Paxton, Curran, & Kirby, 2001), which may have been overparameterised, and the superiority of more parsimonious models (Morin, Morizot et al., 2011).

expectations regarding the expected nature of the profiles (which is arguably not the case here), these confirmatory models still need to be contrasted with unconstrained models to show that their degree of fit to the data remains comparatively acceptable (Finch & Bronk, 2011).

Once the final solution has been identified, predictors and outcomes were added to the model, while keeping in mind that the addition of these covariates should not qualitatively change the profiles (Marsh et al., 2009). Predictors were added to the final model (mastery and performance motivational climates) using a multinomial logistic regression, while outcomes (intention to be physically active and physical activity participation) were included as “distal outcomes” (including them as additional profiles indicators without allowing them to influence the solution; e.g. Muthén & Muthén, 2014). The inclusion of these covariates in the model helps to limit Type 1 errors by combining analyses and have been shown to systematically reduce biases in the estimation of the model parameters, especially those describing the relationships between the covariates and the profiles (which otherwise tend to be underestimated; e.g., Bolck, Croon, & Hagenaars, 2004; Marsh et al., 2009; Morin & Wang, in press).

Results

Preliminary Analyses and Descriptive Statistics

The a priori CFA model estimated on AGPEQ (Scaled $\chi^2 = 221.48$, $df = 42$, $NFI = .964$, $NNFI = .954$, $CFI = .971$, $RMSEA = .049$, 90% CI of $RMSEA = .042$ to $.055$) and the classroom climate measures (Scaled $\chi^2 = 467.33$, $df = 59$, $NFI = .920$, $NNFI = .907$, $CFI = .929$, $RMSEA = .062$, 90% CI of $RMSEA = .056$ to $.067$) revealed acceptable fit indices, supporting the factor validity of these measures. The descriptive statistics including means, standard deviations, internal reliabilities, and correlations of all variables used in this study are presented in Table 1. The scale score reliability of all subscales also proved fully satisfactory, ranging from .71 to .88. The participants were generally moderately high in mastery climate and mastery-approach goal and moderate in avoidance goals. The rest of the variables were lower than the mid-point of the scales. The correlations show that mastery climate was positively related to mastery-approach and mastery-avoidance goals. All achievement goals were moderately and positively correlated with one another. However, mastery-approach goals had stronger association with mastery-avoidance goals. Mastery-approach goals also had stronger

correlations with intentions to be physically active and physical activity participation, compared to the other goals. Both mastery-avoidance and performance-avoidance goals had small relationships with intention to be physically active, which was also positively associated with physical activity. In line with previous research focusing on social or cognitive predictors of physical activities (Biddle et al., 2003; Lochbaum & Gottardy, 2015), the observed relations between students' physical activity and achievement goal orientations or perceptions of classroom climate remained much lower than the relations between intentions to be physically active and physical activity.

Latent Profile Analyses

The results of the LPA are presented in Table 2. These results show that while the LMR supports the 4-profile solution, the AIC, CAIC, BIC, and SSA-BIC values continue to decrease with the addition of profiles to the model. However, the decrease in these values (see Figure 1) reaches a plateau between the 3 and 4 profile solution. The examination of these adjacent solutions in terms of statistical and theoretical adequacy supports the 4-profile solution. This solution is depicted in Figure 2. Profile 1 describes only 5.19% of the sample and is characterised by low levels of achievement motivation across the four goals, with a slight dominance for performance, rather than mastery goals. Profile 2 is the exact opposite of profile 1, describing 11.82% of the students with high levels on all dimensions of achievement goals. Profile 3 is slightly more frequent (20.11%) and presents slightly below average levels of achievement motivation across the four goals. Finally, profile 4 is the most prevalent (62.87%), and presents average levels of achievement motivation across the four goals. Overall, these profiles show very few discrepancies within each profile between the four achievement goals, which seems to argue against the added value of distinguishing between these four goals, rather than simply considering the overall level of student's achievement motivation for physical activity, irrespective of the specific form this motivation is taking.

Perceived Classroom Climate and Achievement Goals Profiles.

Students' perceptions of their classroom's motivation climate were then added to this final profile solution as predictors in order to assess their relations with membership into the various motivational profiles. The results from this model are reported in Table 3. These results clearly

support the meaningfulness of the extracted profiles in showing a very well defined pattern of associations between the predictors and profile membership. More specifically, perceptions that physical education classes are characterised by higher levels of mastery orientation climate predict a greater likelihood of membership into the profiles showing the highest levels of achievement goals than in those showing lower levels of achievement goals (all pairwise comparisons significant). Similarly, perceptions that physical education classes are characterised by a higher level of performance orientation climate predict a greater likelihood of membership into the profiles membership showing the highest levels of achievement goals than in those showing lower levels of achievement goals (most pairwise comparisons significant). The only exception is that perceptions of higher levels of performance orientation climate does not to predict the relative likelihood of membership into the two profiles characterised by the lowest levels of achievement goals (profiles 1 and 3).

Outcomes of Achievement Goals Profiles.

Distal outcomes are directly added to the final model, and the results from this analysis are reported in Table 4. Once again, these results support the meaningfulness of the extracted profiles in showing a very well defined pattern of associations between the profiles and outcomes. More specifically, Profile 2 (high achievement goals) showed the highest levels of intention to be physically active and of physical activity participation, followed by Profile 4 (moderate achievement goals) and by Profiles 1 (extremely low achievement goals) and 3 (low achievement goals), who did not significantly differ from one another. To provide a complete picture of the associations between the latent profiles and the covariates, we presented the levels of achievement goals, predictors, and outcomes observed in each of the extracted profiles in Figure 3. These results are interesting when compared to the relatively low correlations that were observed between achievement goal orientation and physical activity levels in Table 1, and suggested the added value of adopting a person-centred perspective. Indeed, as shown in Figure 3, the differences in physical activity levels observed across profiles reach a magnitude of approximately 1 standard deviation when profiles 1 and 3 are compared with profile 2, and of half a standard deviation when they are compared to profile 1.

Discussion

The aim of this study was to identify distinct profiles of students based on their ratings of the 2 x 2 taxonomy of achievement goals. In addition, a multinomial logistic regression was used to examine how these profiles related to perceived motivational climate, intention to be physically active and physical activity participation. Although most studies in the achievement goal literature have ignored the hierarchical or clustered structure of the data, the importance of including proper control for this underlying hierarchical structure is now well-recognised in this research area (e.g., Barkoukis, Ntoumanis, Thogersen-Ntoumanis, 2010; Ntoumanis, Taylor, & Thogersen-Ntoumani, 2012; Papaioannou et al., 2004; Vansteenkiste, Mouratidus, Van Riet, & Lens, 2014) that examined achievement goals and motivational climate using a multilevel approach. Similarly, most previous studies have relied on a variable centred approach. Although the present study did not rely on a formal multilevel approach, it still extends previous research by using LPA in conjunction with a proper correction of nesting effects. To our knowledge, this is the first paper in sport and exercise psychology that uses this approach. One major contribution of the present study is that it has demonstrated how covariates can be integrated to a LPA solution (predictors through multinomial logistic regression, and outcomes through the “distal outcome” method). These approaches reduce the type I errors by combining the analyses in one step (Morin, Morizot, Boudrias, & Madore, 2011; Morin & Wang, in press).

With reference to the first hypothesis (H1), the results of the current study identified four distinct profiles based on the 2 x 2 achievement goals. Three profiles had high, moderate, and low levels of achievement goals (profiles 2, 4, and 3), and one profile had extremely low achievement goals (profile 1). The expected profile presenting high mastery goals and low performance goals was not found in the current study. The results from this study suggest that there were few discrepancies within each of the profiles in terms of the four achievement goals (students levels on all four goals were strictly parallel in each profiles). This raises the question of the need for the inclusion of an approach-avoidance dimension to the traditional dichotomous taxonomy between mastery and performance achievement goals. But even more importantly, it suggests that a global measure of

achievement motivation could be as informative as any form of distinction at the level of specific achievement goals, at least in relation to PE.

A possible explanation for the lack of discrepancy between achievement goals within each of the profiles may be explained by the conception of the 2 X 2 achievement goals constructs. According to Elliot and his colleagues (Elliot 2005; Elliot & Thrash, 2001), a key aspect of achievement goal theory is to focus on the aims that one pursues, and separate these aims from their underlying reasons. Elliot and Thrash (2001) thus argued that individuals may pursue the same achievement goal for fairly different reasons. Conversely, individuals may adopt different achievement goals, but share the same underlying reason for adopting these differentiated goals. For example, a student could focus on improving his/her basketball shooting skills (mastery-approach goal) because s/he enjoys playing the game with his/her friends in his/her leisure time, or because s/he wants to impress his/her classmates at the end-of-module assessment. Alternatively, another student may train hard to avoid being the worst performer in a competition (performance-avoidance goals) to avoid feeling humiliated in front of friends, or to avoid disappointing ones' parents for whom the performance is important. However, two students may try to please their parents by trying to either improve their personal running time (mastery-approach goal) or by outperforming their peers (performance-approach) depending on what is most valued by their parents. Hence, the articulation of the "why" of achievement goals may provide some insights to explain the unique profile patterns found in the present study. Perhaps future LPA goal researchers can include follow-up studies to explore the underlying reasons behind multi-goals adoption.

It is well known that many previous studies in sport and physical activity found positive correlations between the four achievement goals (e.g., Conroy et al., 2003; Wang et al., 2007; 2008). In this study, the correlations between the four achievement goals ranged from .43 to .61. This could be the reason for the lack of differentiation between the four goals in each profile. In the traditional achievement goal theory proposed by Nicholls (1989), mastery (task) and performance (ego) goals were assumed to be orthogonal – which is clearly not the case in this study. Elliot, Murayama, and Pekrun (2011) suggests a 3 x 2 achievement goal model in which achievement goals are further

differentiated between absolute (task-related), intrapersonal (self-related) and interpersonal (other-related) goals. The correlation between other-approach and other-avoidance goals was .83, the correlation between task-approach and task-avoidance goal was .68, and the correlation between self-approach and self-avoidance was .56. Clearly, the distinctiveness of various achievement goals, and the practical utility of maintaining these distinctions should be more critically assessed by future research to see if the current results generalises to other settings, countries, ages, and populations. It seems that, the current results show that the traditional “the more the merrier” expression does not necessarily hold for PE achievement goals.

Specifically, this study revealed four distinct latent profiles of students based on of the 2 x 2 achievement goals. The majority of students (62.9%) corresponded to Profile 4, presenting an achievement goal profiles characterised by an average level on all achievement goals. Two other profiles presented below average (Profile 3), and well-below average (Profile 1) levels on all achievement goals. Fortunately, these profiles appeared to be far less frequent than Profile 4, with the lowest profile (Profile 1, 5.2% of the participants) being even less frequent than Profile 3 (20.11%). Although not as frequent, taken together these two maladaptive profiles contain close to 25% of the total sample, and appear to form a well-defined target for preventive interventions aiming at improving physical activity participation. Braithwaite, Spray and Warburton (2011) have shown that mastery motivational climate interventions in physical education have positive effects on behavioural outcomes (e.g., increased heart rate, fitness, and exercise frequency).

These four profiles were related to different levels of motivational climate, physical activity intention and participation. H2 was thus supported by the results. More precisely, it was found that Profile 2 (including participants with high achievement goals) reported the highest levels of mastery climate, intentions to be physically active, and highest physical activity participation, compared to the other three profiles with the lower achievement goals profiles. Unfortunately, this profile is also infrequent in the population (11.82%), clearly suggesting the need to improve interventions aiming to increase physical activities among secondary school students. These results further suggest that achievement goals could be a valuable way to target specific subgroups of at-risk youths, but may also

represent a valuable intervention target in their own right.

In this regard, the results from the multinomial logistic regression showed that higher perceptions of mastery and performance climates were found to predict a greater likelihood of profile membership characterised by higher levels of achievement goals. This is in line with Wang et al.'s (2010) findings, and suggests that working at improving classroom goal structure may represent a valuable way to nurture achievement goals in students. A study by Spray and his colleagues (Spray et al., 2013) showed that as primary school students transit into secondary school, perceived mastery climate declined and perceived teacher-promoted performance goals increased and that teacher-promoted performance approach goals in PE may enhance positive development of physical self-perceptions in the early years of secondary school. In this current study, it is noteworthy that the predictive power of performance climate seems to be lower than that of mastery climate, as the perceptions of higher levels of performance climate did not predict the relative likelihood of profile membership into the two profiles characterised by the lowest levels of achievement goals motivation (Profiles 1 and 3). Many studies have found that mastery and performance climate are orthogonal in nature (e.g., Soni, Liukkonen, Watt, Yli-Piipari, & Jaakkola, 2014), and that mastery climate predicted mastery-approach and mastery-avoidance goals (Morris & Kavussanu, 2008; Wang et al., 2010). Therefore, the practical implication is that teachers should increase mastery climate, rather than focus on performance climate. The results of the current study further show that participants in the high achievement goal profiles (Profile 2) reported the highest levels of intentions to be physically active and physical activity participation, compared to the other three profiles. Similarly, Wang et al.'s (2010) results showed that mastery-approach goal lead to enjoyment of physical activities. Therefore, it is logical to suggest that teachers should focus on creating a mastery classroom whereby students are encouraged to adopt mastery goals.

This study made some significant contributions worth mentioning. First, it illustrated the use of LPA models incorporating a control for the nesting of students into different classes. Second, this study incorporated the use of multinomial logistic regression, and the “distal outcome” method within a LPA model. The inclusion of the covariates directly into LPA helps to reduce the type I errors by

combining the analyses into one step. However, there are also a few limitations for this study. The physical activity measure is self-reported and, as such, may include more subjectivity than is desirable. There is a need for more valid, direct, and objective measure of physical activity participation in future studies. Secondly, the cross-sectional nature of the data does not allow inferences of the causal effect of the variables. Hence, interventional strategies remain conditional on longitudinal evidence where the proposed effects occur in the expected directions over time. Thirdly, this study only measures situational goal orientation (climate) and dispositional goals (achievement goals in general). Future research would need to measure the goal state (task and ego involvement), that is, the actual goal adopted in achievement setting, and examine the impact of goal state on subsequent intention and behaviour.

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1 **Table 1. Descriptive Statistics and Correlations between All Variables of the Overall Sample**

	Rho	Mean	SD	1	2	3	4	5	6	7
1. Mastery Climate	.88	4.79	1.05							
2. Performance Climate	.71	3.55	.95	.05						
3. Mastery-Approach	.83	4.60	1.25	.51**	.04					
4. Mastery-Avoidance	.77	4.00	1.18	.34**	.16**	.61**				
5. Performance-Approach	.84	3.54	1.35	.19**	.33**	.49**	.52**			
6. Performance-Avoidance	.71	3.96	1.27	.24**	.18**	.43**	.51**	.53**		
7. Intention	.88	3.59	1.45	.24**	.04	.36**	.22**	.23**	.14**	
8. Physical Activity	.80	3.16	1.33	.16**	.05*	.25**	.15**	.21**	.11**	.59**

2 *Note.* * $p < 0.05$. ** $p < 0.01$.

1 **Table 2. Latent Profile Fit Statistics**

Model	Free Parameters	LL	Scaling	AIC	CAIC	BIC	SSA-BIC	LMR	Entropy
1 Profile	8	-11940.123	2.1568	23896.247	23948.255	23940.255	23914.840	---	---
2 Profiles	13	-11322.703	2.5741	22671.406	22755.920	22742.920	22701.620	<0.001	0.726
3 Profiles	18	-10843.442	1.8621	21722.884	21839.904	21821.904	21764.719	<0.001	0.847
4 Profiles	23	-10739.311	1.6071	21524.622	21674.147	21651.147	21578.077	0.002	0.778
5 Profiles	28	-10647.803	1.8239	21351.605	21533.635	21505.635	21416.681	0.195	0.796
6 Profiles	33	-10546.706	2.0689	21159.411	21373.947	21340.947	21236.108	0.270	0.814
7 Profiles	38	-10477.190	1.9904	21030.380	21068.380	21239.421	21118.697	0.211	0.807
8 Profiles	43	-10416.941	1.9017	20919.881	20962.881	21156.428	21019.819	0.212	0.823

2 Note. LL: Model Loglikelihood; Scaling = scaling factor associated with MLR loglikelihood estimates; AIC = Akaike's Information Criterion; CAIC =

3 Constant AIC; BIC = Bayesian Information Criterion, SSA-BIC = sample-size adjusted BIC; LMR = Lo-Mendell-and Rubin likelihood ratio test.

Table 3. Relationships between Perceived Classroom Climates and LPA Membership (Multinomial Logistic Regression).

Predictors	Profile 1 Vs 4		Profile 2 Vs 4		Profile 3 Vs 4		Profile 1 Vs 3		Profile 2 Vs 3		Profile 1 Vs 2	
	Coeff. (SE)	OR	Coeff. (SE)	OR	Coeff. (SE)	OR	Coeff. (SE)	OR	Coeff. (SE)	OR	Coeff. (SE)	OR
Mastery	-1.137 (0.134)**	0.321	1.072 (0.161)**	2.922	-0.404 (0.145)**	0.668	-0.733 (0.146)**	0.480	1.476 (0.235)**	4.375	-2.210 (0.226)**	0.110
Performance	-0.519 (0.179)**	0.595	0.304 (0.108)**	1.356	-0.683 (0.118)**	0.505	0.164 (0.210)	1.178	0.988 (0.161)**	2.686	-0.823 (0.196)**	0.439

Note. * $p < .01$, ** $p < .001$; SE: standard error of the coefficients; OR: Odds Ratio.

Table 4. Relationships between LPA Membership, Intention to be Physically Active and Physical Activity Participation.

Outcome	Profile 1	Profile 2	Profile 3	Profile 4	Differences between Profiles
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	
Intention	2.835 (0.197)	4.560 (0.104)	3.048 (0.117)	3.641 (0.075)	2 > 4 > 1 = 3
Participation	2.593 (0.131)	3.830 (0.108)	2.773 (0.079)	3.226 (0.076)	2 > 4 > 1 = 3

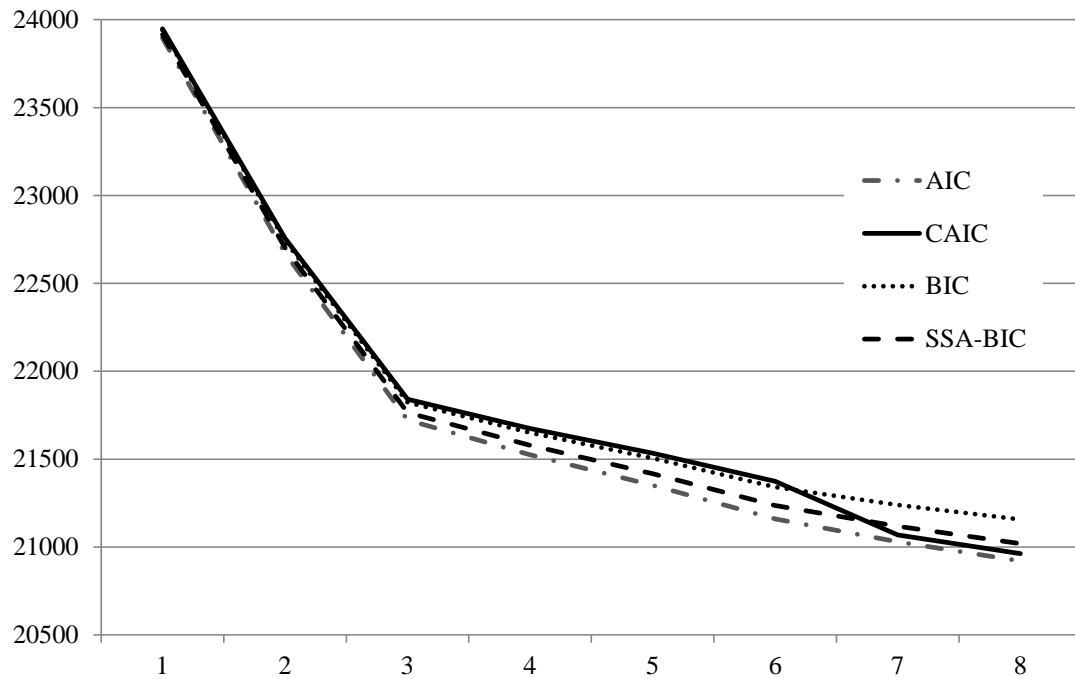


Figure 1. Elbow plot of the fit indices for the latent profile solutions

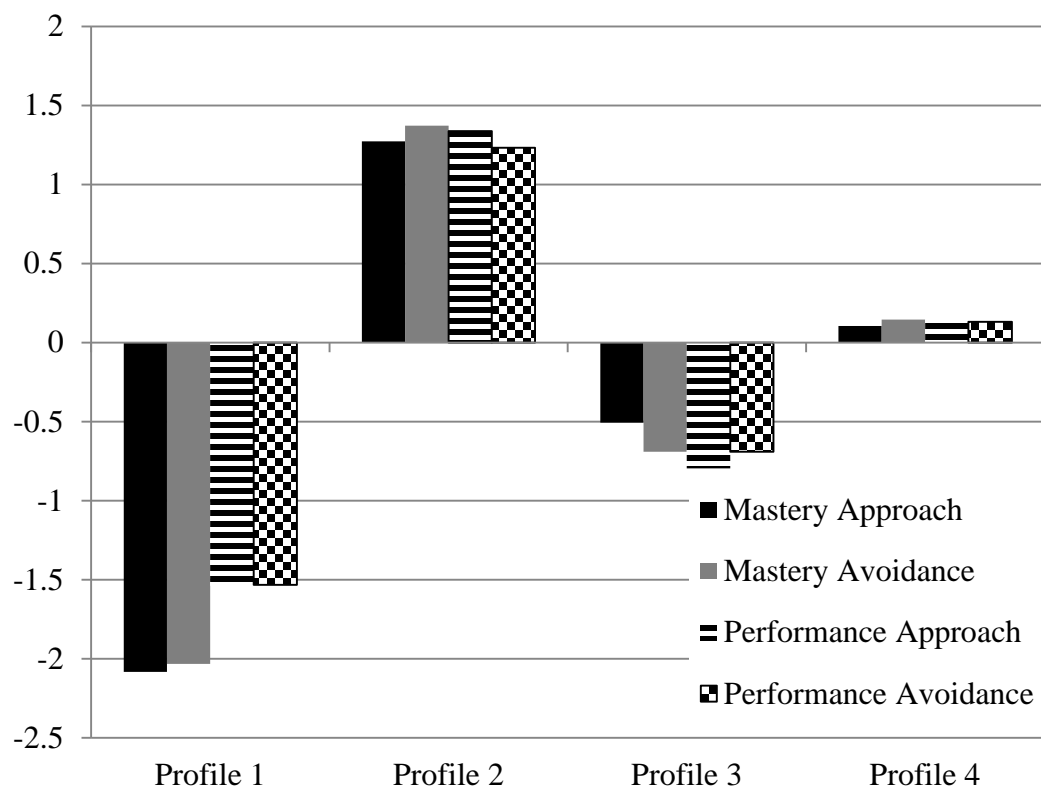


Figure 2. Characteristics of the latent profiles on the achievement goals

Note. The results were standardised to help in the interpretation of this histogram.

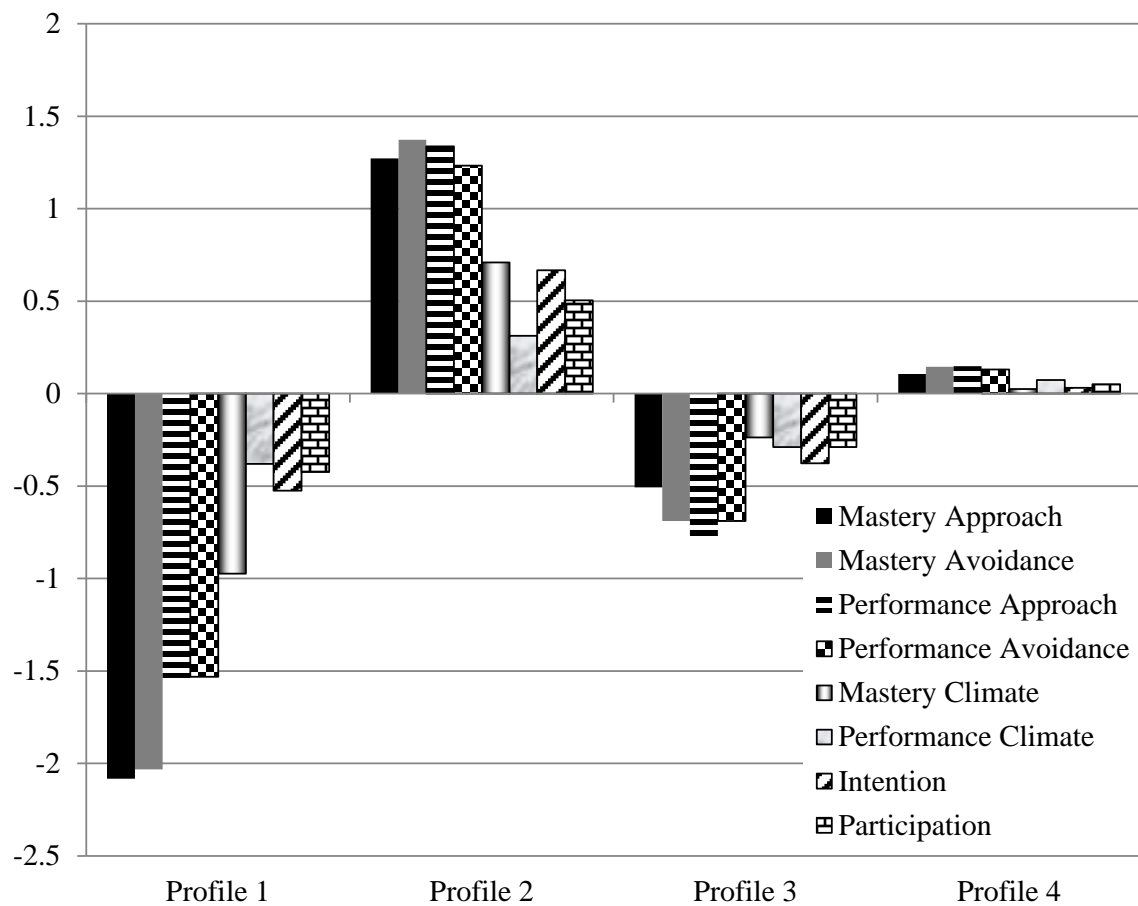


Figure 3. Characteristics of the latent profiles on the achievement goals and all covariates.

Note. The results were standardised to help in the interpretation of this histogram.