ELSEVIER

Psychology of Sport and Exercise 8 (2007) 147–168

Psychology
OF SPORT AND EXERCISE

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The 2 × 2 achievement goal framework in a physical education context

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Received 31 August 2004; received in revised form 2 June 2005; accepted 29 August 2005
Available online 3 March 2006

Abstract

Objectives: To examine the 2 × 2 achievement goal framework (which crosses the task–ego and approach–avoidance distinctions) in a physical education context. The psychometric properties of the 2 × 2 Achievement Goals in Physical Education Questionnaire were tested and correlates of distinct achievement goal profiles were examined in two Asian samples.
Method: Two cross-sectional studies involving youth aged 11–18 years (total $N = 995$) from Singapore.
Results: Confirmatory factor analyses supported the factor structure of the 2 × 2 achievement goal framework in the physical education context. Factorial invariance across gender and athletic status was supported through multi-group analysis. Four distinct clusters were identified, and linked to patterns of psychological characteristics and outcomes.
Conclusion: Achievement goal researchers in sport and exercise psychology may wish to make use of the 2 × 2 achievement goal framework. The intraindividual approach to achievement goal profiles is valuable, yet underutilized at present. However, important questions regarding differences in approach and avoidance motivation across cultures require further research.

The motivation of young people for physical activity is a favoured topic in both the popular and academic media. For example, an analysis of key sport and exercise psychology journals in

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doi:10.1016/j.psychsport.2005.08.012

the 1990s showed that motivation was the most researched topic (Biddle, 1997). One reason for this trend is that regular participation in physical activity for young people contributes to the enhancement of physical, psychological, and social well-being (Biddle, Sallis, & Cavill, 1998), yet research evidence is clear in showing a decline in participation in physical activity during the adolescent years. It is therefore important to examine the factors that might influence adolescents' likelihood of being physically active, and this area has been identified as a research priority (Sallis et al., 1992). One area where all children are guaranteed exposure to physical activity is through school physical education lessons, hence this is an important context in which to study motivation (Biddle, 2001).

Over the past two decades, the achievement goal approach to achievement motivation has been tremendously helpful in acquiring an understanding of affect, cognition, and behaviour in sport and exercise settings (see Biddle, 1999; Duda & Whitehead, 1998; Roberts, 2001; Whitehead, Andree, & Lee, 2004). This approach has not only been fruitful on the conceptual level, but has also produced clear guidelines for application and intervention (Morgan & Carpenter, 2002; Solmon, 1996; Treasure, 1993), even though nearly all studies are cross-sectional (Biddle, Wang, Kavusannu, & Spray, 2003). We sought to examine adolescents' motivation in physical education classes using the achievement goal perspective.

The achievement goal approach posits that individuals interpret the subjective meaning of success in two main ways that correspond to two primary achievement goals—task goals and ego goals. A person adopting a task goal will define success or construe competence in terms of task mastery or improvement. He or she tends to adopt personal criteria of evaluation. A person adopting an ego goal will define success or construe competence in normative terms, such as winning or outperforming others. In sport and physical education, task goals have been found to be positively associated with various indicators of motivation, including intrinsic motivation and positive affect (see Biddle, 2001; Duda, 2001; Roberts, 2001; for reviews). The relationship between ego goals and motivational indictors is less clear, although when combined with task goals, ego goals can be linked to positive processes and outcomes (Biddle et al., 2003; Wang & Biddle, 2001).

Elliot and colleagues (Elliot, 1997; Elliot & Church, 1997; Elliot & Harackiewicz, 1996) have argued that a full account of achievement goals in academic, work, and sport settings requires attention to the approach–avoidance distinction in addition to the task–ego distinction. The distinction between approach motivation and avoidance motivation has deep historical roots in psychology and has been shown to have tremendous theoretical and empirical utility in many different domains of inquiry (Elliot, 1999; Elliot & Covington, 2001). Elliot and colleagues have sought to demonstrate that this approach–avoidance distinction is also of great benefit in analyses of achievement goals (Elliot, 2005).

Elliot and colleagues (Elliot, 1997; Elliot & Harackiewicz, 1996) initially proffered a trichotomous achievement goal framework that bifurcated the ego (labelled performance) goal construct in terms of approach–avoidance. More recently, these researchers (Elliot, 1999; Elliot & McGregor, 2001) have proposed a 2×2 achievement goal framework that fully incorporates the task–ego (labelled mastery-performance) and approach–avoidance distinctions. In this model, competence is viewed as the core of the achievement goal construct, and competence is differentiated in two ways—according to how it is *defined* and according to how it is *valenced*. Competence is defined in terms of the standard used to evaluate competence, either the task

itself/one's own past performance (mastery) or the performance of others (performance). Competence is valenced in terms of whether the focus is on a positive possibility (approach) or a negative possibility (avoidance). Crossing these two dimensions yields four achievement goals that are posited to comprehensively cover the types of competence-based goals that individuals adopt and pursue in academic, work, and sport environments. The four achievement goals are: mastery-approach (focused on task-based or intrapersonal competence, e.g. "I want to learn as much as possible from this class"), mastery-avoidance (focused on task-based or intrapersonal incompetence, e.g., "I am often concerned that I may not learn all that there is to learn in this class"),[1] performance-approach (focused on normative competence, e.g., "It is important for me to do better than other students"), and performance-avoidance (focused on normative incompetence, e.g., "My goal in this class is to avoid performing poorly").

Over the past decade, a wealth of empirical data has accumulated in support of incorporating the approach–avoidance distinction into models of achievement goals. Over 70 studies have been published on the trichotomous achievement goal framework, and this research has clearly supported the utility of this model (Elliot, 2005; Elliot & Moller, 2003).

The 2×2 achievement goal framework is only of recent origin, but a number of studies have already been conducted that support the validity and utility of this framework (see Moller & Elliot, in press, for a review). Nearly all research on approach–avoidance goals in the extant literature have been conducted in academic and work settings. Few studies on approach–avoidance achievement goals have been conducted in sport and exercise settings, although the past few years has seen noteworthy activity in this regard (see Cury, Elliot, Sarrazin, Da Fonseca, & Rufo, 2002; Cury, Da Fonseca, Rufo, Peres, & Sarrazin, 2003; Halvari & Kjormo, 1999; Smith, Duda, Allen, & Hall, 2002), including research on the 2×2 framework (Conroy, Elliot, & Hofer, 2003; see Elliot & Conroy, 2005). In addition, despite early writings on achievement goals being rooted in cross-cultural psychology (Maehr & Nicholls, 1980), the vast majority of goals research in sport and exercise psychology has been conducted in Western cultures (Biddle et al., 2003). More is needed on how participants from different cultures construe achievement goals, and how goals are related to other psychological constructs within non-Western cultures.

In short, the trichotomous and 2×2 achievement goal frameworks are already in place, both in the educational and the sport and exercise literatures. Thus, the present research is designed to continue exploration of the 2×2 model in the sport/exercise domain by examining its applicability across important demographic categories, and by examining the links between the goals of the model and other motivational constructs within a new cultural context. Specifically, in Study 1, we sought to examine the psychometric properties of a 2×2 achievement goal questionnaire modified for the physical education context in a sample of Singaporean adolescents. In addition, we sought to test the degree to which the hypothesized 2×2 structure of achievement goals is applicable across gender and degree of athletic participation. Thus far, the validity of the 2×2 model has only been tested within a rather narrow range of individuals, and the present

[1] The mastery-avoidance goal construct may seem counterintuitive to many, because mastery goals have typically been construed in the literature in purely positive, appetitive terms. However, if one conceptualizes mastery goals according to how competence is defined, as does the 2×2 model, the idea that mastery-based goals may be aversive would seem to become non-controversial. Clearly, individuals who define competence using an intrapersonal standard, for example, may focus on either doing better than before or not doing worse than before; in the 2×2 model, the former is characterized as a mastery-approach goal, whereas the latter is characterized as a mastery-avoidance goal.

research will help to determine the generalizability of this conceptual approach. In Study 2, we sought to examine achievement goal profiles with respect to various psychological characteristics and outcome measures. This is important because it answers the call for research on multiple goal perspectives in achievement goal research (Barron & Harackiewicz, 2001; Duda, 2001; Pintrich, 2000). Furthermore, our research adopted an intraindividual approach to multiple goals; this type of approach is quite uncommon in achievement goal research, despite its documented promise (see Bembenutty, 1999; Hodge & Petlichkoff, 2000; Meece & Holt, 1993; Wang & Biddle, 2001), and has yet to be applied to the 2×2 achievement goal framework.

Study 1: Confirmatory factor analysis

In this study, the 2×2 achievement goal items developed by Elliot and McGregor (2001) were modified for use in the physical education context, and the factor structure of the resulting 2×2 *Achievement Goals in Physical Education Questionnaire* (2×2 AGPEQ) was tested using confirmatory factor analysis (CFA). In addition to testing the hypothesized 2×2 model, CFA was used to test alternative models. Finally, the invariance of the measurement model across gender and athletic status (school athletes vs. non-athletes) was examined with additional CFAs in order to establish the generalizability of the 2×2 structure of achievement goals.

Method

Participants and procedure

Secondary school students ($N = 348$; 162 males, 186 females) in Singapore participated in the study. Participants ranged from 12 to 16 years of age ($M = 13.52$, $SD = 0.37$), with 162 representing their school in sports and games at the national level (and were classified as "athletes"), and 186 classified as "non-athletes".

Permission to conduct the study was granted by the headteachers and heads of physical education departments. Students were told that their participation in the study was voluntary, that they were free to withdraw at any time, that there were no right or wrong answers to the questions, and that their responses would be kept confidential. All students who were given a chance to participate provided informed consent. The questionnaire was administered by the students' physical education teachers at the beginning of their lessons.

Measures

Achievement goals. The original 12-item 2×2 questionnaire was designed to measure achievement goals in the general undergraduate classroom context (Elliot & McGregor, 2001). The modified version, the 2×2 AGPEQ, changed "class" to "physical education class" and "content of this course" to "certain aspects of physical education." Pupils responded on 5-point scales ranging from "not at all true for me" (1) to "very true for me" (5). These scales were changed from 7 points (in the original Elliot and McGregor's measure) to 5 points in order to simplify the response options for this younger age group.

Results and discussion

A variety of CFAs were conducted using the EQS statistical program (Bentler & Wu, 1998). Maximum likelihood estimates were derived from covariance matrices, and pairwise deletion was used for missing data. A total of 15 cases were deleted. Maximum Likelihood estimation was chosen based on the normality of the univariate statistics. All of the items had skewness and kurtosis values between +1 and −1 and the distribution of the data showed multivariate normality (Mardia's coefficient was 45.39 and the Normalized estimate was 22.59). Model fit was evaluated using the following indices: Root Mean Squared Residual (RMSR), Root Mean Squared Error of Approximation (RMSEA), Goodness-of-Fit Index (GFI), Adjusted GFI (AGFI), and Comparative Fit Index (CFI).[2] The RMSR is the square root of the mean of the squared difference between the implied and observed covariance matrices. The RMSEA is also based on the analysis of residuals and compensates for the effects of model complexity. For these two indices of model fit, values close to .08 and .05 represent a good fit and a close fit, respectively, to the data (Hu & Bentler, 1999). The GFI and AGFI are indicators of absolute fit, that is, the relative amount of the observed variances and covariances accounted for by the model. AGFI adjusts the GFI by taking into account the degrees of freedom in the model (Holye & Panter, 1995). CFI assesses lack of fit as estimated by the non-central χ^2 distribution of a target model compared to a baseline model. For these latter fit indexes (GFI, AGFI, and CFI), there is general agreement that .90 represents a satisfactory fit to the data (Hu & Bentler, 1999). Importantly, fit indices are indicators of the overall fit of the model to the data, and do not specify the misfit of individual items. Therefore, factor loadings and error variances of the individual items were also examined.

The fit indices from the CFA indicated an adequate fit of the proposed model to the data ($\chi^2(48) = 144.97$, $p < .001$; RMSR = .07; RMSEA = .08; GFI = .94; AGFI = .90; CFI = .93). The factor loadings and error variances of the items are presented in Fig. 1. All of the items showed relatively strong loadings (.73 on average and .45 at minimum), and satisfactory error variance. Cronbach alpha coefficients for the achievement goal scales were as follows: mastery-approach, $\alpha = .83$; performance-approach, $\alpha = .84$; mastery-avoidance, $\alpha = .71$; performance-avoidance, $\alpha = .66$, respectively.

The intercorrelations among the four achievement goals are presented in Fig. 1. Mastery-approach goals were positively associated with mastery-avoidance and performance-approach goals. Mastery-avoidance goals were positively related to performance-approach and performance-avoidance goals. The correlation among the two performance goals was also positive. Our findings are similar to those reported in a sport context by Conroy et al. (2003) with comparable correlations for 4 of the 6 permutations. However, our results showed stronger associations between the two mastery goals and between performance-avoidance and mastery-approach and

[2]The Chi-square statistic will be presented, but will not be used in evaluating model fit. The conventional criterion for accepting a model is when the *p*-value for the chi-square is greater or equal to .05. However, the significance of the chi-square statistic is unduly affected by large sample sizes such that small deviations of the hypothesised model from the true model may lead to rejection of the hypothesised model (see Kelloway, 1998). In addition, the chi-square test does not directly provide degree of fit compared to other indices that are normed from 0 to 1 (Bagozzi, 1993).

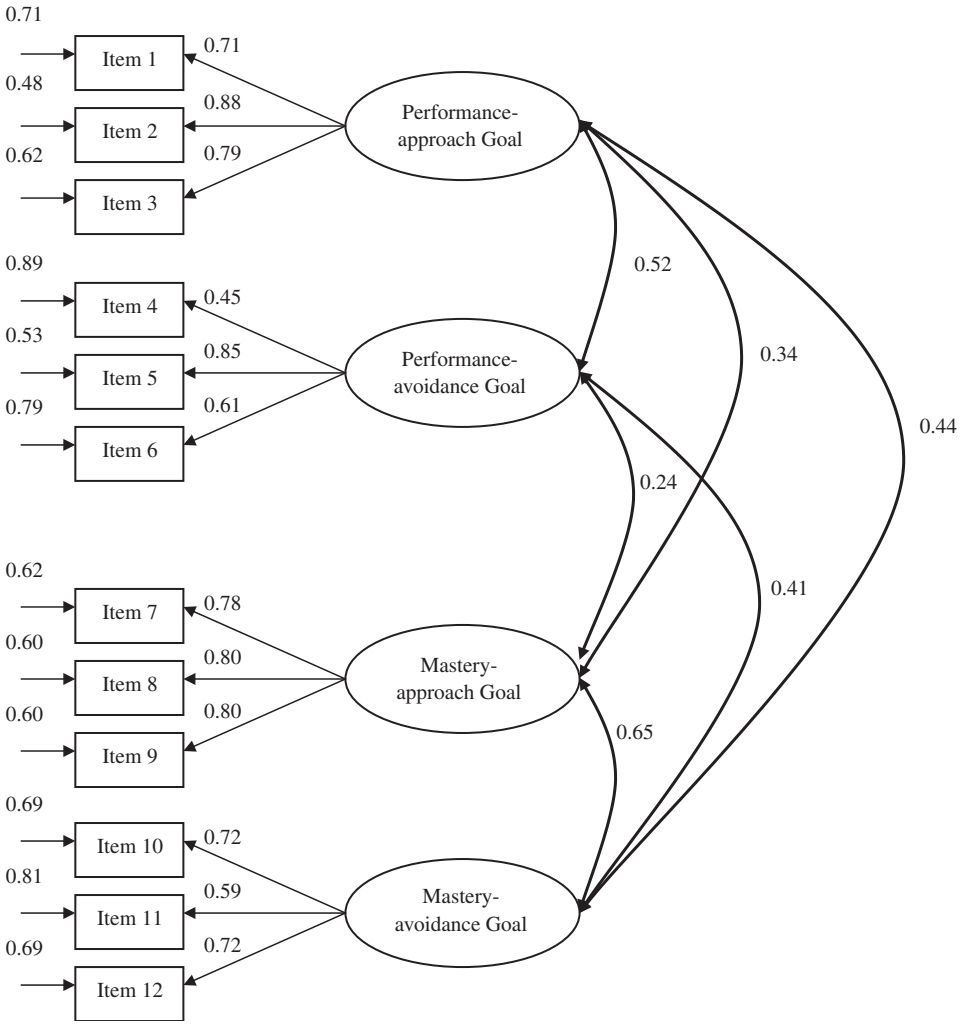

Fig. 1. Confirmatory factor analysis of the achievement goal items. Values shown are standardised coefficients.

this may be a reflection of the context, age or culture in the present sample. Only future research will help resolve this issue.

Additional CFAs were conducted to compare the hypothesized model with two alternative models examined by Elliot and McGregor (2001). These procedures test the relative sufficiency of various dichotomous and trichotomous models in accounting for the data. The two alternative models tested were: (a) Trichotomous Model A, in which the performance-approach and -avoidance items load on their respective latent variables, and the mastery-approach and -avoidance items load together on a third latent variable; and (b) Dichotomous Model B, in which the mastery-approach and -avoidance items load on one latent variable, and the performance-approach and -avoidance items load on another latent variable. The justification for the first model is that perception of ability in performance goal (high versus low ability) could determine

Table 1
The fit indices for the four alternative CFA models compared to the hypothesized model (Study 1)

Fit index	Hypothesized model	Trichotomous model A	Dichotomous model B
χ^2	144.97**	245.97**	342.51**
df	48	51	53
CFI	.93	.87	.80
GFI	.94	.88	.85
AGFI	.90	.82	.77
RMSR	.07	.09	.10
RMSEA	.08	.11	.13
Model comparison			
Hypothesised model vs. trichotomous model A			$\Delta\chi^2(3) = 101.00$, $p < .001$
Hypothesised model vs. dichotomous model B			$\Delta\chi^2(5) = 197.54$, $p < .001$

Note: CFI = Comparative fit index; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; RMSR = root mean squared residuals; RMSEA = root mean square error of approximation. ** $p < .01$

the behavioural patterns (approach versus avoidance) whereas the level of perception of ability is not relevant in mastery goal, according to achievement goal theory (Nicholls, 1989). In the latter model, the theoretical position of the model is based on classic mastery and performance goals by collapsing the approach and avoidance items. Table 1 displays the results of the CFAs. The analyses show support for the hypothesized 2×2 model with none of the other models evidencing a satisfactory overall fit. The hypothesized 2×2 model was a better fit to the data than each of the alternative models.

The next phase of the analysis involved testing the factorial invariance of the achievement goal measure across gender and athletic status through multi-sample analyses (Bentler & Wu, 1998). First, the total data set was split by gender and then by athletic status, and model testing involved fitting the hypothesized 2×2 model to each subgroup separately. Next, the invariance of the model across gender and athletic status was tested by simultaneously fitting the model to the data for males and females, and, subsequently, for athletes and non-athletes. The baseline models were identical across groups. The fit indexes indicated an adequate fit for all groups, although the fit was somewhat better for non-athletes compared to athletes (see Table 2). Finally, equality constraints were imposed on all of the factor loadings to be estimated (but not on the fixed parameters). The equivalency of the measurement model for gender and athletic status was then assessed. Table 2 shows the fit statistics that support the invariance of the 2×2 measurement model across gender and athletic status.

Study 2: goal profiles, psychological characteristics, and outcomes

The results of Study 1 confirmed the factor structure and internal consistency of the 2×2 AGPEQ. In this study, a goal profile analysis will be used to examine the psychological characteristics and outcome variables associated with the goals of the 2×2 framework. Achievement goal researchers (e.g., Fox, Goudas, Biddle, Duda, & Armstrong, 1994; Roberts, Treasure, & Kavussanu, 1996; Walling & Duda, 1995) typically create goal profiles using either

Table 2
Fit Statistics for the Single Groups and Multisample Analyses (Study 1)

Fit statistics	Boys	Girls	Athletes	Non-athletes	Unconstrained Model	Gender	Athletic Status
χ^2	85.17**	98.79**	120.41**	96.50**	205.40**	211.83**	225.45**
df	48	48	48	48	96	104	104
CFI	.92	.93	.91	.92	.91	.91	.90
GFI	.92	.92	.91	.93	.91	.91	.90
AGFI	.87	.87	.85	.88	.86	.86	.85
RMSR	.06	.06	.06	.06	.06	.07	.07
RMSEA	.07	.08	.08	.07	.06	.06	.06
Model comparison							
Unconstrained model vs. invariant factor loading across gender						$\Delta\chi^2(8) = 6.34$, $p > .01$	
Unconstrained model vs. invariant factor loading across athletic status						$\Delta\chi^2(8) = 20.05$, $p > .01$	

Note: CFI = comparative fit index; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; RMSR = root mean squared residuals; RMSEA = root mean square error of approximation. ** $p < .01$

mean- or median-split methods. These methods impose a structure on the observed data that may be artificial and may not fit "reality" (Wang & Biddle, 2001). Another method used to create goal profiles is cluster analysis. This technique identifies homogenous groups or clusters based on the shared characteristics they possess. It is different from discriminant analysis in that the researcher has no knowledge of the number and characteristics of the groups before applying cluster analysis. Therefore, the groupings obtained allow the researchers to examine intraindividual differences in goal profiles rather than looking at individual differences. The purposes of this study were to examine whether homogenous achievement goal profiles exist and, if so, the ways in which these profiles differ in terms of their psychological characteristics and outcomes.

To examine the psychological characteristics of the different groupings or clusters, several motivational constructs were assessed. In choosing our constructs, we concur with Duda and Hall (2001). They stated that "for a more complete understanding of human striving in the sport milieu, it is important that researchers turn to models of motivation that compliment and extend each other and are conducive to testing in a synthesized fashion. It appears that achievement goal theory and the self-determination framework are two such conceptualizations of motivated behavior" (p. 427). Although self-determination theory (SDT) is just one framework of motivation, it has shown itself to be important in sport and exercise psychology (Vallerand & Fortier, 1998) in reflecting why people participate in a given activity. Moreover, it has been found to offer conceptually coherent findings when used alongside goal orientation measures (Biddle & Wang, 2003; Wang & Biddle, 2001; Wang, Chatzisarantis, Spray, & Biddle, 2002). For example, Wang et al. (2002) found that ego goals were associated with less self-determined forms of motivation while those with high task goals had higher intrinsic motivation. In addition, review level data shows that a task orientation is associated with social motives for participation, while perceived competence is associated with both task and ego goal orientations (Biddle et al., 2003).

SDT, therefore, was the basis for assessing our motivational constructs. It is a perspective on self-regulation that may be viewed as complementary to the achievement goal perspective in that

it identifies qualitatively distinct sources of motivation that impact how persons engage in and experience activities, including competence-relevant activities. In SDT, individuals are presumed to have basic, innate needs that must be met for optimal functioning to occur, and these three needs are relatedness (i.e., the desire to connect to others and the social world), competence (i.e., the desire to experience mastery and effective interaction with the environment), and autonomy (i.e., the need to feel ownership of one's behaviour; Ryan & Deci, 2000). Variables relevant to each of these needs were included in the present study. Relatedness and competence were assessed through direct measures of the constructs; autonomy was assessed in a more complex fashion, as described below. Given that Deci and Ryan propose that more intrinsic motivation and optimal psychological functioning is likely when these needs are satisfied, it is expected that the needs will be associated more strongly with a mastery-approach goal than other goals.

Behavioural regulation can be of many different types in SDT, including external regulation, introjected regulation, identified regulation, and intrinsic motivation. External regulation refers to behaviour that is controlled by external sources like rewards or constraints imposed by others. Introjected regulation refers to behaviour that is self-imposed or internally controlled. For identified regulation, the individual acts because the activity is valued and judged as important. Finally, intrinsically motivated behaviour is behaviour that is engaged in solely for its own sake. These four "reasons" for acting may be placed on a relative autonomy continuum, ranging from the least autonomous, external regulation, to the most autonomous, intrinsic motivation (Ryan & Connell, 1989). Research has shown the benefits of more autonomous behavioural regulation in physical activity contexts with youth (Biddle, Soos, & Chatzisarantis, 1999; Wang & Biddle, 2001). In SDT, individuals are said to be amotivated to the extent that they perceive little contingency between their behaviour and their outcomes, and have no autonomous reason for engaging in behaviour (Deci & Ryan, 1985). Vallerand and Fortier (1998) suggest that the study of amotivation "may prove helpful in predicting lack of persistence in sport and physical activity" (p. 85). Both relative autonomy and amotivation were examined in the present study. Wang and Biddle (2001) found a 'self-determined' cluster with participants with high task orientation and moderately high perceptions of competence. This corresponded to the highest level of relative autonomy and lowest amotivation compared to other clusters, and a negative score for ego orientation. On the contrary, the 'amotivated' cluster had the lowest scores on task orientation, perceived competence, and relative autonomy, and the highest amotivation, compared to other clusters.

In addition to motivational constructs, we also assessed affective and behavioural 'outcome' variables. Enjoyment and boredom were chosen as indicators of affective outcomes, and effort and physical activity participation were chosen as behavioural indicators. The sport and exercise psychology literature has shown that different achievement goals are related to different beliefs about effort and exertion. For example, mastery (task) goals are positively associated with the belief that hard work and collaboration with peers leads to success, whereas performance (ego) goals are positively related to the view that success is achieved through having high ability or through external factors such as cheating or deception (Biddle et al., 2003; Guivernau & Duda, 1998; King & Williams, 1997; Spray, Biddle, & Fox, 1999; White & Duda, 1993). Mastery goals have been found to be moderately positively associated with enjoyment and negatively related to boredom (Biddle et al., 2003; Goudas, Biddle & Fox, 1994; Liukkonen, Telama, & Biddle, 1998). Very few studies have used behavioural indicators, such as physical activity participation, when

examining different achievement goals, although some have used indicators of behaviour, such as free-time involvement—a marker of intrinsic interest—seeking challenging tasks, and intentions (Biddle et al., 2003; Cury et al., 2003, 2002). The findings seem to indicate that motivation-related behaviours are associated in a small positive way with task orientation but are unrelated to ego orientation (see Biddle et al., 2003; Duda & Hall, 2001). In sum, it is important to test whether different goal orientations are differentially associated with markers of effort and behaviour even if precise hypotheses are not possible at this stage of knowledge.

In this study, therefore, we examined the psychological characteristics, and affective and behavioural outcomes of the 2×2 achievement goals at an intraindividual level.

Method

Participants and procedure

Secondary school students ($N = 647$; 256 males, 277 females, 114 gender unspecified) in Singapore participated in the study.[3] Participants ranged from 11 to 18 years of age ($M = 13.92$, $SD = 1.14$). As in Study 1, participants were classified as athletes ($n = 178$; 27.8%) or non-athletes ($n = 464$; 72.2%). The procedure for this study was the same as that for Study 1.

Measures (see Table 3 for reliability information)

Achievement goals: The same achievement goal measure used in Study 1, the 2×2 AGPEQ, was used in this study.

SDT variables: An adapted version of Relatedness and Perceived Competence subscales of the Intrinsic Motivation Inventory (IMI; Deci & Ryan, 2001; McAuley, Duncan, & Tammen, 1989) were used to assess relatedness (3 items; e.g., "Physical education allows me to interact with my friends") and perceived competence (6 items, e.g., "I think I am pretty good at this physical education class"). Participants responded to all items on 5-point scales ranging from "strongly disagree" (1) to "strongly agree" (5).

The Perceived Locus of Causality (PLOC) measure developed by Goudas et al. (1994) was used to assess the four types of behavioural regulation in the physical education context. This measure is a modified version of a measure originally developed by Ryan and Connell (1989). The stem for all items was 'I take part in physical education …'. Four items were used to assess both external regulation (e.g., '… because I'll get into trouble if I don't') and introjected regulation (e.g., '…because I'll feel bad about myself if I didn't'). Identification (e.g., '…because I want to improve in physical education') and intrinsic regulation (e.g., '…because physical education is fun') were measured using three items each. Cronbach's Alphas for the measures were as follows: external regulation = .77, introjected regulation = .65, identified regulation = .74, and intrinsic motivation = .83. An overall relative autonomy index (RAI) was calculated by weighting each subscale in the following way: external regulation (-2) + introjected regulation (-1) + identified regulation $(+1)$ + intrinsic motivation $(+2)$ (see Goudas et al., 1994). The final RAI measure serves as an indicator of a person's overall motivational orientation with positive scores representing more autonomous regulation and negative scores representing more controlling

[3]This sample is completely separate from the sample for Study 1.

Table 3
Means, standard deviations, and internal reliability coefficients of the measures (Study 2)

Subscales	α	*M*	SD	1	2	3	4	5	6	7	8	9	10	11
1. Mastery-approach	.72	3.57	0.86	1.00										
2. Performance-approach	.74	2.85	0.98	0.42**	1.00									
3. Mastery-avoidance	.73	3.04	0.84	0.40**	0.35**	1.00								
4. Performance-avoidance	.60	3.21	0.90	0.41**	0.39**	0.38**	1.00							
5. RAI	—	4.79	4.03	0.53**	0.12**	0.21**	0.12**	1.00						
6. Amotivation	.72	1.94	0.87	−0.42**	−0.08*	−0.10*	−0.09*	−0.67**	1.00					
7. Relatedness	.85	3.39	0.98	0.53**	0.24**	0.20**	0.17**	0.41**	−0.30**	1.00				
8. Perceived competence	.78	2.99	0.74	0.52**	0.44**	0.21**	0.20**	0.35**	−0.23**	0.45**	1.00			
9. Enjoyment	.83	3.78	0.85	0.65**	0.29**	0.26**	0.27**	0.61**	−0.46**	0.54**	0.54**	1.00		
10. Effort	.77	3.64	0.78	0.63**	0.31**	0.18**	0.22**	0.55**	−0.44**	0.43**	0.56**	0.69**	1.00	
11. Boredom	.75	2.06	0.93	−0.47**	−0.07	−0.07	−0.09*	−0.56**	0.54**	−0.31**	−0.31**	−0.55**	−0.61**	1.00
12. Physical activity	.80	2.52	0.92	0.30**	0.22**	0.10**	0.09*	0.25**	−0.21**	0.20**	0.34**	0.31**	0.33**	−0.20**

regulation. Amotivation was assessed using the same stem used for the RAI-based items and three items (e.g., ' …but I really don't know why'). The score for amotivation was not included in the computation of RAI because Deci and Ryan (1985) maintain that RAI concerns the extent to which one's motivation is self-determined, but amotivation is a state of lacking any intention to act (i.e., not being motivated). Participants responded to all items on 5-point scales ranging from "strongly disagree" (1) to "strongly agree" (5).

Enjoyment, effort, boredom, and physical activity participation: Two other subscales of the IMI were modified to assess aspects of participants' subjective experience related to physical education. The two subscales were: enjoyment (5 items; e.g., "I usually enjoy doing physical education"), and effort (5 items; e.g., "I try very hard at physical education"). In addition, three items were used to assess boredom (e.g., "I usually find doing physical education very boring"). Participants responded to all of the items using 5-point scales ranging from "strongly disagree" (1) to "strongly agree" (5).

We used four items to create a measure of participants' physical activity participation outside of their physical education lessons (e.g. "Not including school physical education lessons, how often do you play sport/exercise?"; "Please indicate how many times per week you have been exercising or playing sports"). Participants responded on 4-point scales from "hardly ever or not at all" (1) to "more than four times a week" (4).

Results and discussion

Table 3 shows the internal reliability coefficients, correlations, means and standard deviations of the study variables. All of the achievement goal mean scores were above the midpoint of the scale (all were $\geqslant$2.85 on the 5-point scale), although they do not appear to be as high as those reported by Conroy et al. (2003), even when accounting for the different scales used. For example, Conroy et al. in employing 7-point scales reported three means that were at least 74% of the scale maximum, whereas our scores (using 5-point scales), showed three subscales between 57% and 64% and one at 71.4%. Our findings are more consistent with normal distributions, notwithstanding the common finding of high mastery scores.

The achievement goal data were submitted to hierarchical cluster analysis. Before the cluster analyses were carried out, all the variables were standardized using Z scores (mean of 0 and a standard deviation of 1). Standardization prevents variables measured in larger units contributing more towards the distance measured than the variables utilizing smaller units in the cluster analysis. In this data analytic approach, each observation starts out as its own cluster. Subsequently, new clusters are formed by combining the most similar observations until either all observations are grouped into a single cluster or the researcher determines that a parsimonious solution has been achieved based on the agglomeration schedule and dendrogram. Ward's method was chosen to minimize the within-cluster differences and to avoid problems with "long chaining" of the observations found in other methods (Aldenderfer & Blashfield, 1984).

From the agglomeration schedule, it was found that the merging of a four-cluster solution to a three-cluster solution created a bigger change in the coefficients (10%) than previous mergings (less than 8% change). This indicated that dissimilar clusters were being merged at this point. Accordingly, it was determined that a four-cluster solution was suitable for the data. This decision was clearly supported by the dendrogram.

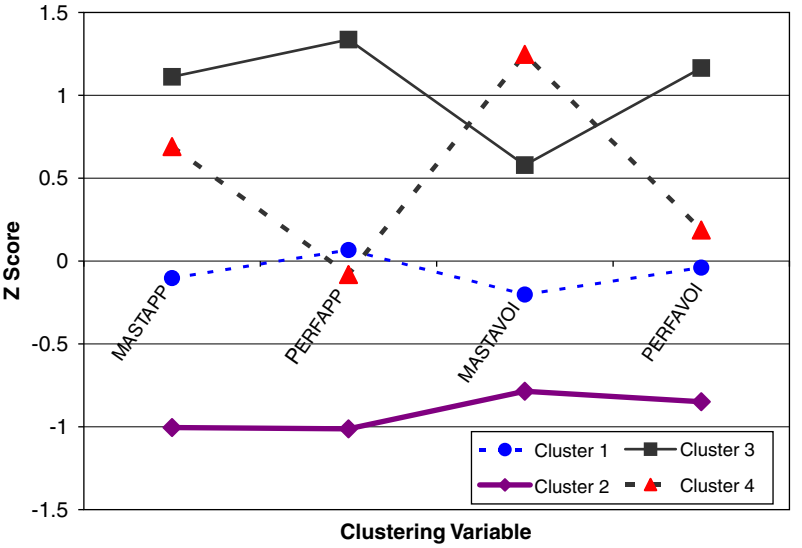

Fig. 2. Four achievement goal profiles identified by hierarchical cluster analysis.

Fig. 2 shows the four distinct goal profiles identified through cluster analysis. Cluster 1 is characterized as a "*moderate achievement goals*" profile with all four achievement goals close to a standard score of zero. There were 300 students in this cluster with both genders equally represented; 73% were non-athletes. Cluster 2 consisted of students with a "*low achievement goals*" profile, in which all achievement goal scores are around $Z = -1.00$. This cluster comprised 148 students with 67.2% females; 77% were non-athletes. Students classified in Cluster 3 had a "*high achievement goals*" profile with scores of mastery-approach, performance-approach, and performance-avoidance goals above $Z = 1.00$ and mastery-avoidance goal scores above $Z = 0.50$. This cluster consisted predominantly of males (67%) with 40% athletes and 103 students overall. Cluster 4, labelled "*mastery achievement goals*," consisted of students with high mastery-approach and mastery-avoidance goal scores, and moderate performance-approach and performance-avoidance goal scores. 94 students were in this cluster with 57.5% males and 76% non-athletes (see Table 4). The clusters are consistent with findings from the literature on dichotomous goals (Hodge & Petlichkoff, 2000; Wang & Biddle, 2001).

The next stage of the analysis was to examine the psychological characteristics of the four clusters using the SDT variables. A one-way MANOVA was conducted with relatedness, perceived competence, RAI, and amotivation as the dependent variables and cluster as the independent variable. The results of the multivariate test indicated significant and conceptually coherent differences among the four clusters on the dependent variables (Wilks' $\Lambda = .707$, $F(12, 1683) = 19.64$, $p < .001$, $\eta^2 = .11$). An ANOVA was conducted on each dependent variable as a follow-up to the MANOVA; Type I error was controlled using the Bonferroni procedure, and each ANOVA was tested at the .0125 level of significance. The ANOVA for each dependent variable was significant: relatedness ($F(3, 639) = 35.58$, $p < .001$, $\eta^2 = .14$); perceived competence ($F(3, 639) = 53.56$, $p < .001$, $\eta^2 = .20$); RAI ($F(3, 639) = 28.38$, $p < .001$, $\eta^2 = .12$; and amotivation ($F(3, 639) = 12.79$, $p < .001$, $\eta^2 = .06$).

Table 4
Profiles for the four-cluster solution from the hierarchical cluster analysis (Study 2)

Clustering variable	Cluster 1 ($N = 300$)		Cluster 2 ($N = 148$)		Cluster 3 ($N = 103$)		Cluster 4 ($N = 94$)	
	Means (z)	SD	Mean (z)	SD	Mean (z)	SD	Mean (z)	SD
Mastery-approach	3.49 (−.10)	0.64	2.71 (-1.00)	0.64	4.53 (1.11)	0.51	4.17 (.69)	0.51
Performance-approach	2.92 (.07)	0.68	1.86 (-1.01)	0.54	4.17 (1.34)	0.63	2.77 (−.08)	0.92
Mastery-avoidance	2.87 (−.20)	0.56	2.38 (−.79)	0.63	3.53 (.58)	0.83	4.09 (1.25)	0.58
Performance-avoidance	3.18 (−.04)	0.70	2.45 (−.85)	0.66	4.26 (1.16)	0.57	3.38 (.19)	0.91
RAI	4.62 (−.04)[a]	3.77	2.80 (−.49)[b]	4.20	6.32 (.38)[c]	3.64	6.84 (.51)[c]	3.35
Amotivation	2.04 (.11)[a]	0.85	2.13 (.22)[a]	0.96	1.55 (−.45)[b]	0.71	1.75 (−.22)[b]	0.81
Relatedness	3.34 (−.05)[a]	0.85	2.86 (−.55)[b]	0.88	3.94 (.57)[c]	1.00	3.76 (.38)[c]	0.99
Per. competence	2.96 (−.04)[a]	0.67	2.54 (−.61)[b]	0.61	3.60 (.83)[c]	0.69	3.12 (.17)[a]	0.65
Enjoyment	3.71 (−.09)[a]	0.76	3.22 (−.66)[b]	0.82	4.39 (.71)[c]	0.68	4.25 (.55)[c]	0.69
Effort	3.58 (−.08)[a]	0.71	3.16 (−.62)[b]	0.70	4.24 (.76)[c]	0.70	3.94 (.38)[d]	0.66
Boredom	2.15 (.11)[a]	0.88	2.32 (.28)[a]	0.96	1.67 (−.42)[b]	0.90	1.75 (−.32)[b]	0.84
Physical activity	2.44 (−.08)[a]	0.81	2.23 (−.31)[a]	0.82	2.99 (.51)[b]	1.08	2.67 (.17)[b]	0.99
Cluster characteristics								
Boys n (%)	113 (45.7%)		40 (32.8%)		55 (67.1%)		46 (57.5%)	
Girls n (%)	134 (54.3%)		82 (67.2%)		27 (32.9%)		34 (42.5%)	
Athletes n (%)	81 (27.0%)		34 (23.0%)		41 (40.0%)		22 (24.0%)	
Non-athletes n (%)	218 (73.0%)		113 (77.0%)		62 (60.0%)		70 (76.0%)	

Note. Means in the same row that do not share subscripts differ at $p < .01$ in the Tukey honestly difference comparison.

Post hoc tests using Tukey's HSD were used for pairwise comparisons between each of the groups (see Table 4). Clusters 3 and 4 did not differ in relatedness, RAI, and amotivation. Clusters 3 and 4 scored higher on relatedness than the other two clusters ($p < .001$). For perceived competence, there was no significant difference between Clusters 1 and 4, although the other clusters differed significantly from each other ($p < .001$), For RAI, Clusters 3 and 4 had significantly higher scores compared to Clusters 1 and 2 ($p < .001$). Clusters 1 and 2 were similar in terms of amotivation, and these clusters scored higher on amotivation than Clusters 3 and 4 ($p < .001$) (see Fig. 3).

The final stage of the analysis involved testing affective and behavioural outcome measures. A one-way MANOVA was conducted with enjoyment, effort, and boredom as the dependent variables and cluster as the independent variable. A separate ANOVA was conducted for physical activity. The results of the multivariate test indicated significant differences between the four clusters on the dependent variables (Wilks' $\Lambda = .731$, $F(9, 1553) = 23.69$, $p < .001$, $\eta^2 = .10$). Table 4 displays the means and standard deviations on the dependent variables for the four clusters. An ANOVA was conducted on each dependent variable as a follow-up to the MANOVA. The ANOVAs for enjoyment ($F(3, 640) = 62.20$, $p < .001$, $\eta^2 = .23$), effort ($F(3, 640) = 54.06$, $p < .001$, $\eta^2 = .20$), and boredom ($F(3, 640) = 15.18$, $p < .001$, $\eta^2 = .07$) were significant.

Fig. 4 displays a graphical representation of the four goal profiles. Post hoc tests revealed that Clusters 3 and 4 scored equally high in terms of enjoyment, effort, and boredom. These two clusters had significantly higher scores on enjoyment and effort and lower scores on boredom

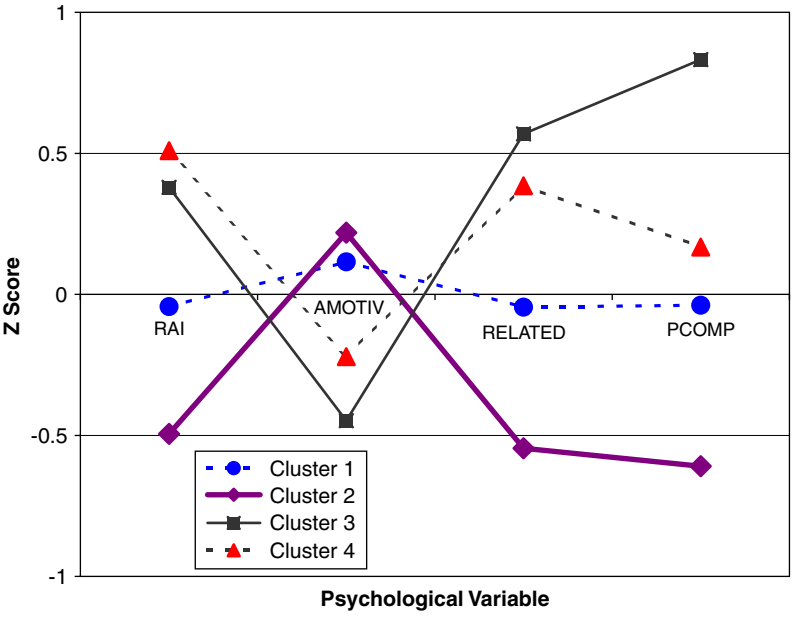

Fig. 3. Psychological characteristics of the four goal profiles.

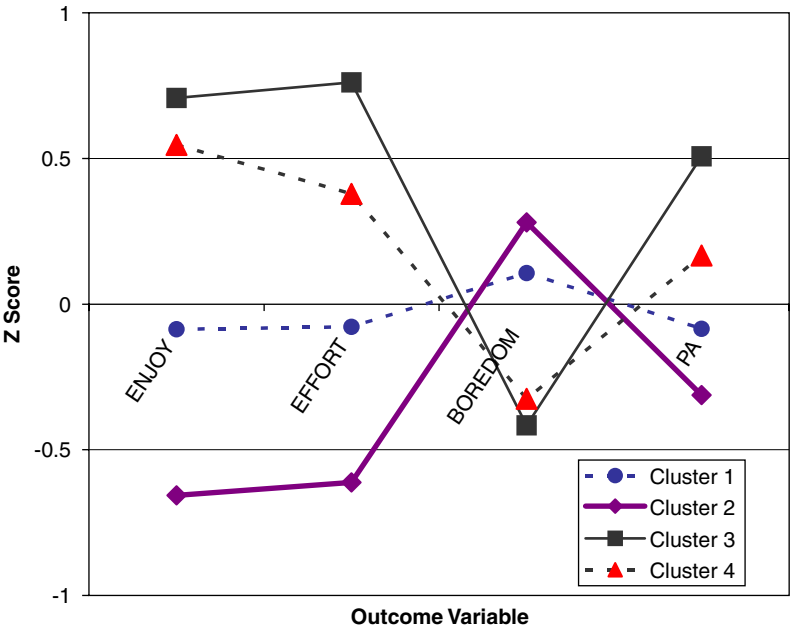

Fig. 4. Outcome measures of the four goal profiles.

compared to Clusters 1 and 2. Clusters 1 and 2 had significantly different levels of enjoyment and effort from each other, but no difference in boredom scores.

A significant difference was found between the four clusters for physical activity ($F(3, 641) = 16.46$, $p < .001$, $\eta^2 = .07$). Post hoc tests revealed that students in Cluster 3 had significantly higher physical activity participation than students in Clusters 1 and 2 (all $ps < .001$); students in Cluster 4 had significantly higher physical activity participation than students in Cluster 2 ($p < .001$). No significant differences were found between Clusters 1 and 2, and between Clusters 1 and 4.

In sum, a consistent pattern was observed for the four clusters across the dependent variables. The ''high achievement goals'' group (Cluster 3) evidenced the most positive pattern of characteristics and outcomes, and similar to the ''mastery achievement goals'' group (Cluster 4). The ''moderate achievement goals'' (Cluster 1) cluster showed 'average' responses to many of the variables, while the ''low achievement goals'' (Cluster 2) group was the motivationally least adaptive. While these findings are consistent with previous research in that high mastery and performance goals were associated with more motivationally adaptive affective and behavioural patterns, and low mastery and performance goals corresponded with least motivationally adaptive patterns (Wang & Biddle, 2001; Wang et al., 2002), more knowledge is needed on how and why the 'high achievement goals' and 'mastery achievement goals' groups are similar, what the role of performance-related goals might be, and the further role played, if any, of the additional distinction made here between approach and avoidance. Motivational researchers are encouraged to pursue these lines.

General discussion

Achievement goal researchers have predominantly used the dichotomous task–ego distinction in sport and exercise psychology research with success (Biddle et al., 2003). However, although results have been informative using this approach, we believe that researchers may also wish to consider the approach–avoidance distinction proffered by Elliot and colleagues (Cury et al., 2002; Elliot & Church, 1997; Elliot & Harackiewicz, 1996). The present research was designed to examine the 2×2 achievement goal framework (which crosses the task–ego and approach–avoidance distinctions) in a physical education context with a novel sample.

In our first study, the 2×2 achievement goal questionnaire developed by Elliot and McGregor (2001) was modified for the physical education context, and the psychometric properties of the resulting 2×2 Achievement Goals in Physical Education Questionnaire were investigated. Confirmatory factor analyses supported the hypothesized four-factor structure consisting of mastery-approach, performance-approach, mastery-avoidance, and performance-avoidance goals, and alternative models were tested and rejected. In addition, results showed that the proposed model generalized across gender and athletic status, as the 2×2 model provided a good fit to the data for males, females, athletes, and non-athletes alike. Application to an Asian sample was also shown.

With regard to the generalizability question, the primary focus of Study 1 was on whether the 2×2 structure of achievement goals applied to both genders and to both athletes and non-athletes. However, when viewed in the broader context of the achievement goal literature, it is apparent that the present research addressed other generalizability questions as well. Most

research conducted on approach–avoidance achievement goals in general, and the 2×2 achievement goal framework in particular, has been conducted with young adult (undergraduate) participants from Western, individualistic countries such as the United States and the United Kingdom. Results from the present research indicate that the 2×2 achievement goal framework is applicable to adolescent (and pre-adolescent) children as well as young adults, and suggests that it is also applicable to persons from a more collectivist country (Singapore, in the present research) as well as individualistic countries. As such, the present research provides evidence that the ego–task and approach–avoidance distinctions represent engrained, structural aspects of competence-relevant motivation. However, we are not able to reconcile the higher inter-factor correlations reported here than in educational settings (Elliot & McGregor, 2001), although our findings were quite similar to the sport research of Conroy et al. (2003). Further consideration is required with tests focusing on the possible effects of age, context and culture.

In the second study of our research, cluster analysis was utilized to identify intraindividual achievement goal profiles, and to examine their links to various psychological characteristics and outcomes. Four achievement goal clusters were identified in the data, and it was the cluster consisting of high scores on all four achievement goals that was linked to the most positive set of characteristics and outcomes. Participants in this cluster evidenced the highest relatedness and perceived competence, and the lowest amotivation, and also reported the most effort in, the least boredom in, the most participation in, and the most enjoyment of physical education activities. Conversely, the cluster consisting of low scores on all four achievement goals was linked to the least positive set of characteristics and outcomes. Participants in this cluster evidenced the lowest autonomy, relatedness, and perceived competence, and the highest amotivation, and also reported the least effort in, the most boredom in, the least participation in, and the least enjoyment of physical education activities.

These results are somewhat surprising with regard to the task–ego distinction, and are very surprising with regard to the approach–avoidance distinction. The latter may be explained by the interrelatedness of the four factors (see in Study 1), but more needs to be known about the relative importance and interaction between goals and approach/avoidance. In terms of the task–ego distinction, most proponents of the achievement goal perspective assume that task goals are associated with positive characteristics and outcomes, whereas ego goals are associated with negative characteristics and outcomes, particularly when perceived competence is low (Dweck, 1986; Nicholls, 1989). However, some researchers have questioned this view, and have suggested that the adoption of both task and ego orientations may represent the ideal motivational profile (Biddle, 2001; Farr, Hofmann, & Ringenbach, 1993; Fox et al., 1994). Our results are more in accord with the latter than the former view, although it is important to note that a cluster representing high task goals and moderate ego goals was also linked to a positive set of characteristics and outcomes. Clearly more research is needed to explore the ways in which task and ego goals operate in concert to regulate achievement behaviour.

In terms of the approach–avoidance distinction, the general assumption in the literature is that approach goals are associated with positive characteristics and outcomes, whereas avoidance goals are associated with negative characteristics and outcomes (Elliot, 1997). Our results are not in accord with this view, as the adoption of avoidance goals in combination with the adoption of approach goals was shown to be the optimal motivational profile. These findings may reflect the fact that our study was conducted with participants from a collectivistic country, as opposed to

participants from an individualistic country. Prior research (Elliot, Chirkov, Kim, & Sheldon, 2001) has found that persons from collectivistic countries have a greater propensity to adopt avoidance goals, and that the pursuit of avoidance goals is not linked to negative outcomes for those in collectivistic cultures in the way that it is for individualistic cultures. As such, it is possible that the negative empirical pattern that has been found for avoidance goals in the extant research is, at least to a degree, culturally constrained, and the findings of the present research may be seen as supporting this premise. Clearly, empirical work is needed to further explore cultural differences in motivation and regulation. In addition, and as the literature on dichotomous goals shows, the adoption of mastery goals seems to override any negative aspects that might accrue for performance goals. The same may be true in this sample for the avoidance and approach dimensions. It appears that one can be motivated in a positive way when adopting some form of avoidance goal, as long as it is accompanied by approach goals. This needs testing further.

An additional aspect of our results that warrants further consideration is that males were more strongly represented in the most adaptive achievement goal cluster (high scores on all four achievement goals), whereas females were more strongly represented in the least adaptive achievement goal cluster (low scores on all four achievement goals). This pattern is consistent with the findings of Wang and Biddle (2001), who showed that males were over-represented in the optimal motivational cluster, whereas females were over-represented in the "at risk" clusters. Gender, like culture, is a topic that has not received sufficient empirical attention in the achievement goal literature to date, and findings such as these that signal potentially problematic motivational profiles for female students lend an urgency to the call for more work in this area, although the patterns are, of course, consistent with the international literature showing lower physical activity rates for girls (Sallis, Prochaska, & Taylor, 2000).

Limitations of the present study include the cross-sectional designs and lack of true measures of behaviour as outcome variables in Study 2. The achievement goal literature also suffers from likely conceptual overlap between items and constructs and thus potential for variables to share systematic error variance, and this study may be no different. Moreover, other motivational frameworks, either instead of or in addition to SDT, could be used to test the logical nature of the 2×2 model.

In conclusion, the present research provides further evidence for the validation of the 2×2 achievement goal framework in the physical education context across gender and athletic participation, and highlights interesting questions about consequences of avoidance motivation in collectivistic, as opposed to individualistic, cultures. Importantly, these questions emerged from our use of an intraindividual analysis of achievement goal profiles. This approach to achievement goal research is of clear and unique value, yet it remains a rarity in the extant literature. We encourage achievement goal researchers to consider this underutilized approach, particularly as they begin to move in earnest toward a consideration of how multiple goals are adopted and pursued in achievement settings.

Appendix A. The 2×2 achievement goals in physical education questionnaire

Mastery-approach

- I want to learn as much as possible from Physical Education class.

- It is important for me to learn skills taught in Physical Education class as thoroughly as I'd like.
- I desire to completely master the material presented in Physical Education class.

Mastery-avoidance

- I am often concerned that I may not learn all that there is to learn in Physical Education class.
- Sometimes I'm afraid that I may not learn certain aspects of Physical Education as thoroughly as I'd like.
- I worry that I may not learn all that I possibly could in Physical Education class.

Performance-approach

- It is important for me to do better than other students in Physical Education class.
- It is important for me to do well compare to others in Physical Education class.
- My goal in Physical Education class is to perform better than others.

Performance-avoidance

- My fear of performing poorly in Physical Education class is often what motivates me.
- My goal in Physical Education class is to avoid performing poorly.
- I just want to avoid doing poorly in Physical Education class.

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