JOURNAL OF APPLIED SPORT PSYCHOLOGY, 20: 137–156, 2008

ISSN: 1041-3200 print / 1533-1571 online
DOI: 10.1080/10413200701805265

Routledge
Taylor & Francis Group

Motivational Profiles of Junior College Athletes: A Cluster Analysis

L. K. Zason Chian and C. K.John Wang

National Institute of Education, Nanyang Technological University, Singapore

The purpose of this study was to identify the motivational profiles underlying sport participation among young Singaporean college athletes, as well as to examine the relationships between motivational profiles and a range of cognitive, affective, and behavioral indices. Junior college athletes ($N = 303$, mean age $= 17.64$, $SD = .60$) completed a questionnaire assessing achievement goal orientations, self-determination, sport ability beliefs, perceived competence, and other motivational indices. Four meaningful clusters were identified and validated with differences in perceived motivational climates and other variables. The use of cluster analysis in the present study proved fruitful in identifying subgroups of athletes with differentiated motivational patterns. Consequently, the information obtained could assist coaches in designing intervention programs that target their athletes' motivational needs.

In the pursuit of sports excellence, maximizing athletes' motivation has always been a key concern in sport psychology. For the past two decades, the study of achievement motivation in physical activity and sport has focused on the social-cognitive approach. According to Roberts (2001), the social-cognitive approach involves a dynamic process that incorporates cognitive, affective, and value-related variables in the attainment of a personally or socially valued goal.

To provide a multidimensional perspective to the social-cognitive approach, recent researchers have made use of profiling procedures to investigate the dynamics of motivational constructs such as goal orientation (Etnier, Sidman, & Hancock II, 2004; Geogiadis, Biddle, & Anweele, 2001; Hodge & Petlichkoff, 2000; Wang & Biddle, 2001; Wang, Chatzisarantis, Spray, & Biddle, 2002), self-determination (Vlachopoulos, Karageorghis, & Terry, 2000), and self-perceptions (Weiss, Ebbeck, & Horn, 1997).

Using a cluster analytical approach, Wang and Biddle (2001) combined several social-cognitive theories, such as achievement goal theory (Duda, 2001; Nicholls, 1989), sport ability beliefs (Dweck, 1999; Dweck & Leggett, 1988), and self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000, 2002) to identify subgroups of young people with varying motivational patterns in the physical activity domain. This study showed that cluster analysis was useful in identifying distinct groups of students with homogenous motivational patterns. The purpose of the present study was to extend Wang and Biddle's (2001) study on a sample of junior college athletes in Singapore using the achievement goal theory, perceived motivational climate, sport ability beliefs, and self-determination theory frameworks.

Received 7 October 2005; accepted 20 December 2006.

Address correspondence to C. K. John Wang, Physical Education and Sports Science, National Institute of Education, Blk 5 #03-20, 1 Nanyang Walk, Singapore, 637616. E-mail: ckjwang@nie.edu.sg

Achievement Goal Theory

Achievement goal theory is one of the most popular theoretical approaches for studying achievement motivation in recent years. A recent systematic review by Biddle, Wang, Kavussanu, and Spray (2003) involving 98 published articles in English from 1990 to 2000 ($N = 21,076$) illustrates its significance. According to Nicholls (1989), there are two major goal perspectives in achievement goal theory: task and ego. A task goal focuses on the development of competence, while an ego goal reflects an underlying concern with the demonstration of competence or the avoidance of being judged as incompetent.

From a cross-cultural perspective, Kim and Gill (1997) supported the adaptive nature of task orientation using a Korean sample. In their study, Kim and Gill reported young Korean athletes with high task orientation worked harder in practice and competitions and experienced greater enjoyment. However, the relationship between task and ego orientations in cross-cultural settings has been equivocal. Kim and Gill (1997) reported a positive and significant relationship between the two goals. In another study, Li and colleagues confirmed a positive relationship between task and ego orientations for a Thai sample, but not for those from Taiwan and the United States (Li, Harmer, Chi, & Vongjaturapat, 1996). Li et al. (1996) explained the variation in the relationship between goal and ego orientations in their cross-cultural samples may be attributed to the interaction of levels of sport participation (e.g., instructional vs. competitive) and culture. Therefore, there is a need to examine motivational profiles from a cross-cultural perspective.

In general, task and ego orientations are proposed to be independent (Nicholls, 1989). In other words, an individual can be high/low in both task and ego orientations, as well as predominately high in one orientation and low in the other. Therefore, research studies should examine their interactive effects rather than only discuss the effects of each goal independently. However, Biddle, Wang, Kavussanu et al. (2003) found that more than 80% of the studies reviewed did not examine interactive goal profiles. By ignoring the independence of task and ego orientations, it is possible that incorrect conclusions may have been made. Nonetheless, all studies support the claim that a high task orientation is often good for motivation.

Recent studies adopting a goal profiling approach may provide a better understanding of the cognitive and behavioral patterns of individuals with different combinations of task and ego orientation levels (Etnier et al., 2004; Hodge & Petlichkoff, 2000; Wang et al., 2002). Using this approach, the results from these studies have shown varying characteristics in goal profiles. For example, Hodge and Petlichkoff (2000) were not able to locate any extreme goal profiles (high task/high ego or low task/low ego). On the other hand, Wang et al. (2002) confirmed the presence of high task/high ego, high task/low ego, low task/high ego, and low task/low ego groups. They also found high task/high ego groups show the most adaptive motivational profiles such as higher perceived competence and higher participation rate in physical activity. However, Etnier et al. (2004) found that the high task/high ego groups were least self-determined. These studies showed that cluster profiles are sample specific and thus interpretation cannot be based solely on objective terms (Harwood, Cumming, & Fletcher, 2004).

Perceived Motivational Climate

Perception of motivational climate is another central construct in achievement goal theory. Nicholls (1989) proposed that there are individual differences that predispose an individual to be task- or ego-oriented. However, an individual's perception of the motivational climate may affect the goals that one adopts in a particular setting. It has been suggested that a

mastery-oriented climate is one that encourages effort as well as rewards mastery and personal improvement, whereas a performance-oriented climate is one that fosters interpersonal competitions and normative ability (Duda, 2001).

In general, athletes who perceive a mastery motivational climate tend to be associated with adaptive motivational outcomes such as higher intrinsic motivation (Biddle, 2001; Standage, Duda, & Ntoumanis, 2003) as well as self-referenced perceived ability and higher satisfaction in practice (Boixadós, Cruz, Torregrosa, & Valiente, 2004). On the other hand, athletes with perceptions of a performance motivational climate are closely related to maladaptive motivational patterns such as amotivation (Petherick & Weigand, 2002) and normative perceived ability (Boixadós et al., 2004). From the existing literature, it seems that perceptions of motivational climate are important variables to consider alongside achievement goals.

Sport Ability Beliefs

Nicholls maintained that goal adoption is dependent on the development of conceptions of ability. In the process of the differentiation of ability, children move from a less differentiated conception to a more differentiated conception of ability as they get older (Nicholls, 1989). For adolescents and adults, ability may be constructed in both a differentiated and an undifferentiated manner in achievement settings, depending on the goals that they adopt. In contrast, Dweck (1999) proposed that two clusters of beliefs underpin the adoption of achievement goals. These beliefs center on the way people view the malleability of intelligence. Specifically, those who subscribe to the view that intelligence is fixed and relatively stable hold an "entity" view or theory, whereas those who perceive intelligence as malleable and open to development hold an "incremental" view or theory. The main concerns of the entity theorists are how much intelligence they have compared to others, and how to look "smart" and not "dumb" at all costs (Dweck, 1999). To them, looking smart means easy, low-effort success and outperforming others (ego goals). On the other hand, looking smart has a different meaning to the incremental theorists. For them, focusing on effort to increase their intelligence, as well as learning and mastery of new challenging tasks, make them feel smart (task goals).

There are clear differences between the approaches advocated by Dweck and Nicholls. Specifically, Dweck (1999) assumed that achievement goals are strongly influenced by personal and individual characteristics, such as personal theories of intelligence, while Nicholls (1989) maintained that goals are linked to different ways of judging success. Despite the conceptual differences underpinning the adoption of goals, Dweck and Nicholls arrived at similar predictions about task involvement (learning goals) and ego involvement (performance goals). Therefore, the main concern of this study was to understand the links between sport ability beliefs and goals, and the motivational consequences of such beliefs and goals operating in achievement contexts.

Recent studies conducted by Biddle and his associates (Biddle, Wang, Chatzisarantis, & Spray, 2003; Wang & Biddle, 2001) have supported the conceptual links of sport ability beliefs and goals. That is, incremental beliefs predicted task goals and entity beliefs predicted ego goals. In addition, it was found that enjoyment of physical activity in youth was predicted directly by a task orientation and incremental beliefs. On the other hand, entity beliefs predicted amotivation, regardless of levels of perceived competence. Thus, believing that athletic ability is a gift and is stable appeared to be maladaptive, even for individuals who were confident about their level of ability.

Self-Determination Theory

From the self-determination theory perspective (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000, 2002), intrinsic motivation is evident when people do something for its own sake. Task goals are therefore predicted to promote intrinsic motivation because involvement in the activities is experienced as an end in itself. Ego goals, on the other hand, are predicted to have a negative relationship with intrinsic motivation because the expectation of engagement in the tasks is seen as a means to an end. There are clear conceptual links between achievement goal theory and self-determination theory (see Ntoumanis, 2001). SDT maintains that goals are driven by psychological needs (autonomy, competence, and relatedness) which, in turn, regulate achievement behavior. There are three types of behavioral regulations proposed by self-determination theory. These are: intrinsic motivation, extrinsic motivation, and amotivation.

Intrinsic motivation is the key in sustaining involvement in sport and physical activity (Biddle & Mutrie, 2001). Besides intrinsic motivation, there are different forms of extrinsic motivation proposed in SDT along the self-determination continuum. From the lower to the higher level of self-determination, these forms of extrinsic motivation are external, introjected, identified, and integrated forms of regulation. Vallerand and Rousseau (2001) highlighted that children and adolescents could be too young to experience or have achieved a sense of integration with the self. Hence, integrated regulation will not be used in the present study. At the other end of the continuum is amotivation. This refers to a lack of motivation that emerges when an individual has no perceived contingency between actions and outcomes (Vallerand & Fortier, 1998). The individual perceives that there is little or no purpose in continuing with the activity.

Hence, the different behavioral regulations form a self-determination continuum that is characterized by the degree of internalization. According to Ryan and Connell (1989), the Relative Autonomy Index (RAI) can be used as an indicator of self-determination. The RAI involves weighting and summing of the behavioral regulations using some simple mathematical computations. Higher scores will indicate more autonomous regulation, while lower scores will indicate more controlling regulation.

To examine the interactive relationship between extrinsic and intrinsic motivation, Vlachopoulos et al. (2000) used a cluster analysis to identify sub-groups of sport participants with varying motives for participation. Results confirmed two types of motivational clusters. The first cluster consisted of sport participants with both self-determined and non-self-determined motives and the second cluster of only self-determined motives. Further analysis showed the former cluster scores were significantly higher on enjoyment, effort, satisfaction, positive affect, negative affect, attitude toward sport participation, and self-determination intentions toward sport participation in the long term.

In the educational domain, several cross-cultural researchers (Heine, 2003; Iyengar & DeVoe, 2003; Oishi, 2000) have suggested that the SDT concept of autonomy may be less applicable in the Eastern cultures as the experience of autonomy is not valued as strongly by Eastern learners. Furthermore, such experiences are also less encouraged by their instructors and parents (Rothbaum, Weisz, Pott, Miyake, & Morelli, 2000; Tseng, 2004). In contrast, Vansteenkiste and his colleagues maintained that autonomy as defined within SDT, is universally important and reflects the intrapersonal and phenomenological experience of volition and choice (Vansteenkiste, Zhou, Lens, & Soenens, 2005). In their cross-cultural study on Chinese samples, Vansteenkiste et al. (2005) found that autonomous study motivation positively predicted adaptive learning attitudes, academic success, and personal well-being. In addition, parental autonomy support was related to more adaptive learning strategies (e.g.,

concentration and effective time management) and higher well-being (e.g., life satisfaction, vitality, and positive affect). To further support the claims of SDT regarding the cross-cultural importance of autonomy, Chirkov and colleagues found that irrespective of the cultural practice in their Brazilian and Canadian samples, participants reported higher levels of psychological well-being when they were more internalized or autonomously regulated (Chirkov, Ryan, & Willness, 2005).

In sum, studies have shown that profiling using cluster analysis could integrate achievement goal theory, perceived motivational climate, sport ability beliefs, and self-determination theory frameworks to provide a better understanding of an individual's motivational profile. However, there are still gaps to fill in existing research. For example, given the importance of a comprehensive motivation profile, few researchers have examined all three major domains (cognitive, behavioral, and affective) of motivation in one combined study. In addition, many of these studies did not include any motivational indicators such as perceived motivational climates, effort, and enjoyment to establish the discriminating powers of the motivational patterns observed. Furthermore, most motivation profiling studies have been conducted in Europe and North America. Little is known about how these constructs are related in samples from an Asian perspective.

Summary and Purpose of the Study

The present study aimed to extend Wang and Biddle's (2001) study in three ways. First, this study focused on the motivational profile of athletes from an Asian perspective. Second, perceived motivational climate was included as one of the motivational indicators. Finally, the relationships among the motivational profiles identified are examined with a range of cognitive (perceived motivational climates), behavioral (effort), and affective (boredom and enjoyment) indices.

In the present study, we assumed that the cluster analysis would provide a comprehensive profile of athletes with distinct variations in goal orientation, self-determination, and sport ability beliefs. Based on the results in previous studies (Wang & Biddle, 2001), we hypothesized that the same clusters would reveal more adaptive motivation such as high task orientation, incremental ability belief, and higher levels of intrinsic motivation and perceived competence, with more positive affect and effort, as compared to the others.

METHOD

Participants

The initial sample consisted of 141 boys and 165 girls ranging in age from 16 to 19 ($M = 17.46$, $SD = .60$) and representing four different junior colleges in Singapore. Among the initial sample, three cases were deleted due to missing data and outliers. All the participants from the resultant data were members of their respective sports teams, 144 from individual sports and 159 from team sports. The sports participated in were basketball, bowling, canoeing, cross-country, field hockey, netball, rugby, soccer, softball, squash, swimming, table-tennis, tennis, track and field, volleyball, and water-polo. Also, 78.5% of the students in the final sample participated at the national inter-college level.

Procedures

After seeking the approval of the principals, teachers-in-charge from the respective colleges were approached and arrangements were made for the administration of the questionnaires.

All the questionnaires, including information about the sample demographics, nature of sport played, and amount of time spent on sports participation each week were completed in quiet classroom conditions. Participants were informed about the general purpose of the study and also told that their identities would be kept strictly confidential and that all the items in the questionnaires should be answered as honestly as possible.

Measures

Achievement Goal Orientations

The Task and Ego Orientation in Sport Questionnaire (TEOSQ; Duda & Whitehead, 1998) was used to assess athletes' dispositional goal orientations. The stem for the 13 items was "I feel most successful in sport when . . ." and assessed task (e.g., " . . . I learnt something that is fun to do") and ego orientation (e.g., " . . . I score the most points"). Answers were given on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree). Confirmatory Factor Analysis (CFA) on the TEOSQ showed acceptable fit indices (Comparative fit index, CFI = .94, Goodness of fit index, GFI = .91, Non-normed fit index, NNFI = .92, Root meaned squared error of approximation, RMSEA = .08) for this Singaporean sample. Internal consistency coefficients were .78 and .85 for task and ego orientations, respectively.

Perceived Physical Competence

The "sports competence" subscale of the Physical Self-Perception Profile Questionnaire (PSPP; Fox, 1990) was used to assess the athletes' perceived physical competence (e.g. "I feel that I am good when it comes to playing sport"). The original scale adopts a structured alternative format whereby participants chose one of two statements that best describe them and then rate whether it is 'sort of true for me' or 'really true for me'. This produces a 4-point scale ranging from 1 to 4. In this study, the items were modified to a 5-point scale, to be consistent with the rest of the measures. CFA on the single factor PSPP resulted with the following fit indices: CFI = .95, GFI = .93, NNFI = .93, RMSEA = .07. The alpha coefficient for the above subscale was .78.

Perceived Motivational Climate

The Perceived Motivational Climate in Sport Questionnaire—2 (PMCSQ—2; Newton, Duda, & Yin, 2000) was used to measure the perceptions of motivational climate. Previous studies have examined the hierarchical measurement structure of the PMCSQ-2, which consists of two higher order factors and a few first order subscales (Newton et al., 2000). In this study, we were interested in the higher order factors, therefore we collapsed the 33-item inventory into two main subscales, performance (16 items) and mastery (17 items) motivational climates. The stem for each item was "On this team, . . . " and it assessed performance-based motivational climate (e.g., ". . . players are encouraged to outplay the other players") and mastery-based motivational climate (e.g., ". . . the coach wants us to try new skills"). Responses were indicated on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The college athletes in Singapore train and compete as a team for the annual national inter-college competitions even though they may be individual sport athletes. In addition, there is a strong collective identity among Singapore college athletes (Wang, Liu, Wang et al, 2005). Thus, the use of PMCSQ-2 to assess athletes from individual sport teams was justified. The two-factor structure of the PMCSQ-2 yielded fit indices of: CFI = .92, GFI = .90, NNFI = .91, RMSEA = .05. Satisfactory internal reliability coefficients were established for mastery ($\alpha = .87$) and performance climates ($\alpha = .90$), respectively.

Sports Ability Beliefs

The Conceptions of the Nature of Athletic Ability Questionnaire, Version 2 (CNAAQ—2; Biddle, Wang, Chatzisarantis, Spray et al., 2003) was employed to examine the incremental and entity beliefs in sport abilities. Incremental beliefs were assessed through six items (e.g., "to be successful in sport you need to learn techniques and skills, and practice them regularly"). Entity beliefs were also measured using six items (e.g., "to be good in sport you need to be naturally gifted"). Responses were made on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The fit indices for CNAAQ-2 using CFA were: CFI = .96, GFI = .95, NNFI = .94, RMSEA = .05. In the current study, satisfactory internal consistency was obtained for incremental beliefs ($\alpha = .82$) and entity beliefs ($\alpha = .73$).

Relative Autonomy Index (RAI)

There are different measures of SDT behavioral regulations. The Sport Motivation Scale or Echelle de Motivation dans le Sport (SMS/EMS) is a seven-factor designed by Pelletier and his colleagues (Pelletier et al., 1995) which includes three intrinsic dimensions of motivation. Additional scales include the Behavioral Regulation in Exercise Questionnaire (BREQ, Mullen, Markland, & Ingledew, 1997), Perceived Locus of Causality (PLOC) by Goudas, Biddle, and Fox (1994), and the Exercise Motivation Scale (EMS) developed by Li (1999). The PLOC was chosen because it was adapted from Ryan and Connell's (1989) Self-Regulation Questionnaire and Vallerand, Pelletier, Blais, Briere, Senecal, and Vallieres' (1992) Academic Motivation Scale. Although there are differences in measurement, all measures have been shown to conform to a simplex-ordered structure (see Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003). The PLOC did not include integrated regulation.

The stem for all the items in the PLOC was "I take part in sport . . . " External regulation (e.g., ". . . because I'll get into trouble if I don't") and introjection (e.g., ". . . because I feel bad about myself if I didn't") were measured with four items each. Identification (e.g., ". . .because it's important for me to do well in sport") and intrinsic motivation (e.g., ". . .because sport is fun") were assessed through three items each. Responses were indicated on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree). Cronbach alphas for external regulation, introjected regulation, identified regulation, and intrinsic regulation were .80, .69, .72, and .82, respectively.

Following the recommendations of Ryan and Connell (1989), the RAI was calculated by weighing each subscale in the following manner: external regulation X (−2) + introjection X (−1) + identification X (+1) + intrinsic motivation X (+2). Positive scores indicate more autonomous regulation and negative scores indicate more controlling regulation.

Amotivation

Amotivation was also one of the subscales in PLOC (Goudas et al., 1994). The stem for the three items was "I take part in sport . . ." and the three items were: "but I really don't know why," "but I don't see why we should have sport," and "but I really feel I'm wasting my time in sport." A five-factor CFA on PLOC, including amotivation as one of the factors, was conducted. The results showed satisfactory fit indices (CFI = .94, GFI = .91, NNFI = .92, RMSEA = .07). In the present study, the amotivation alpha coefficient was .77.

Intrinsic Motivation Inventory

Three subscales from the Intrinsic Motivation Inventory (IMI: McAuley, Duncan, & Tammen, 1989) were used to assess enjoyment, effort, and tension. There were five items each for enjoyment (e.g., "I usually enjoy playing sports"), effort (e.g., "I usually put in a lot of effort into sports"), and tension subscales (e.g., "I felt very tense when playing sports"). A

three-item boredom subscale from Duda and Nicholls (1992) was added to measure negative affect (e.g., "When playing sport, I usually wish the game would end quickly"). Responses were indicated on a 5-point Likert-type scale, similar to the other subscales. In the current study, internal consistency alpha coefficients of .82, .70, .66, and .62 were obtained respectively for the enjoyment, effort, boredom, and tension subscales, respectively. Both boredom and tension subscales did not meet .70 criteria for the alpha coefficient and were excluded from further analyses.

Data Analysis

A series of Confirmatory Factor Analyses (CFA) was conducted to examine the validity of the measures followed by reliability tests. Descriptive statistics and Pearson product-moment correlations of the main variables were computed. Next, cluster analysis was conducted to identify groups of athletes that responded similarly on the motivational constructs.

The six stages of the cluster analysis decision process were adopted (see Hair, Anderson, Tatham, & Black, 1998). Similar to the study by Wang and Biddle (2001), seven clustering variables were used: task and ego orientations, incremental and entity ability beliefs, perceived sports competence, RAI, and amotivation. To establish the discriminating power of the clusters, we used enjoyment, effort, and perceived motivational climates as criterion variables.

Next, all the cases with missing data in any of the seven clustering variables were deleted. All the variables were standardized using z scores (mean of 0 and a standard deviation of 1) and cases with standard scores greater than three were classified as outliers and were deleted from further analyses. As a result, nine cases were deleted.

Both hierarchical and non-hierarchical cluster procedures were used. In the first step, the hierarchical method establishes the number of clusters, profiles the cluster centers, and identifies any obvious outliers. Ward's method with squared Euclidean distance was used to determine the number of cluster groups. According to Aldenderfer and Blashfield (1984), the Ward's method minimizes the within-cluster differences and avoids problems such as long, snake-like chains that are commonly found in other methods. The cluster centers which emerged from the hierarchical cluster analysis were used as initial seed points in a second cluster analysis using the non-hierarchical method. In this way, the non-hierarchical method was able to verify the results from the hierarchical method. This method was recommended by Hair et al. (1998). To further validate the stability of the cluster solution, a second k-means cluster analysis was performed with random initial seed points.

To make comparisons among the clusters, a z score value of $\pm .50$ was used as a criterion for interpreting "high" versus "low" in each variable. In addition, one-way multivariate analysis of variance (MANOVA) was used to determine if any of the motivational variables showed significant differences among the clusters. Wilks's lambda (Λ) and its associated effect size, eta square (η^2) were used for the above statistical test. According to Green and Salkind (2003), an eta square of .01, .06, and .14 is by convention interpreted as small, medium, and large effect sizes, respectively. If a MANOVA showed a significant result, follow-up tests were conducted using analysis of variance (ANOVA) and post hoc Tukey tests.

Finally, participants' demographic characteristics, nature of sport played, and amount of time spent on sports participation per week were analyzed to add insight to the cluster profiles. Two-way contingency table analysis using crosstabs were used to assess the relationship between these variables and the cluster groups.

RESULTS

Descriptive Statistics and Intercorrelations

Table 1 shows the descriptive statistics, internal consistency coefficients, and correlation matrix for the entire sample. In general, the athletes reported high scores in task orientation, incremental beliefs, RAI, mastery climate, enjoyment, and effort. Task and ego orientations were weakly related, supporting the orthogonal nature of the two goals. In addition, task orientation was positively related to sports competence, incremental ability beliefs, RAI, intrinsic motivation, and perceived mastery climate.

Cluster Analysis

Using the hierarchical method, the dendogram and agglomeration coefficient showed that a four-cluster solution was appropriate for the sample. The cluster means, standard deviations *and z* scores of the clustering variables are shown in Table 2. Using the centroid values of the hierarchical methods as initial seed points, a k-means cluster analysis was conducted. The final centroid values and the cluster sizes in the k-means cluster analysis were compared and found to be similar to those in the hierarchical analysis (see Table 3). The results of a second k-means cluster analysis (see Table 4) supported the stability of the four-cluster results when compared to the previous stages, in terms of both cluster sizes and profiles. About 70% of the participants obtained same group membership. Given the stability of the results between the specified seed points and random selection, the validity of the cluster analysis was supported.

Figures 1 and 2 show the graphical representation of the cluster profiles according to the clustering and criterion variables, respectively.

Clustering and Criterion Variables

Results from a one-way MANOVA indicated that there were significant effects among the clustering variables between the four clusters, Wilks's $\Lambda = .11$, $F\,(21, 816) = 44.08$, $p < .01$, $\eta^2 = .52$. All criterion variables, except perceived performance climate showed significant main effects, Wilks's $\Lambda = .49$, $F\,(12, 760) = 19.48$, $p < .01$, $\eta^2 = .21$. The results are reported in the next section.

Profiles of Cluster Groups

Cluster 1 ($n = 91$) was labeled as a "maladaptive motivated" group. This group of athletes was characterized by high ego orientation and amotivation, as well as positive entity beliefs. Post hoc analyses revealed that athletes in this cluster group had significantly higher z scores in their ego orientation, as compared with the rest of the clusters (all ps $< .01$). In terms of amotivation level, they were significantly higher than those in Clusters 2 and 3 ($p < .01$). In addition, Cluster 1 also had higher positive z scores in perceived performance climate compared to Clusters 2 and 3. Post hoc analyses also revealed that this cluster had significantly higher perceived performance climate when compared with those in Clusters 2 and 3 (all ps $< .01$).

Cluster 2 ($n = 113$) was labeled as a "highly motivated" group. It had the highest z scores in task orientation, incremental beliefs, perceived sports competence, and RAI among all other clusters (all ps $< .01$). In addition, this cluster had higher enjoyment, effort, and perceived mastery climate levels for its criterion variables than all other clusters (all ps $< .01$).

Cluster 3 ($n = 69$) was labeled as a "low competent" group. This group of athletes showed low z scores in ego orientation, perceived incremental beliefs, and sports competence. Post hoc

Table 1
Descriptive Statistics, Internal Consistency, and Coefficients Correlation Matrix for All Variables

	M	SD	α	1	2	3	4	5	6	7	8	9	10
Clustering Variables													
1. Task	4.09	.55	.78										
2. Ego	3.38	.86	.85	.19**									
3. Incremental	4.15	.56	.82	.41**	.09								
4. Entity	2.84	.65	.73	.12*	.22**	−.16**							
5. Sports	3.32	.64	.78	.25**	.29**	.26**	.02						
Competence													
6. RAI	6.25	2.96	—	.44**	−.07	.50**	−.28**	.27**					
7. Amotivation	1.76	.84	.77	−.25**	−.01	−.36**	.34**	−.16**	−.72**				
Criterion Variables													
8. Performance	2.77	.63	.90	.01	.24**	−.05	.38**	.15**	−.16**	.29**			
9. Mastery	4.00	.54	.87	.50**	.02	.57**	−.09	.32**	.44**	−.29**	−.09		
10. Enjoyment	4.09	.59	.82	.39**	.15*	.51**	−.04	.47**	.59**	−.42**	.02	.48**	
11. Effort	3.83	.60	.70	.36**	.14*	.47**	−.06	.41**	.50**	−.39**	−.04	.46**	.59**

*p < .05, **p < .01

Table 2
Cluster Means, Standard Deviations, and Z Scores for the Clustering Variables in the Four-Cluster Solution using Hierarchical Methods

	Cluster 1 ($n = 112$) "Maladaptive Motivated"			Cluster 2 ($n = 115$) "Highly Motivated"			Cluster 3 ($n = 57$) "Low Competence"			Cluster 4 ($n = 10$) "Amotivated"		
	M	**SD**	**z**	**M**	**SD**	**z**	**M**	**SD**	**z**	**M**	**SD**	**Z**
Clustering Variables												
1. Task	4.07	.44	.06	4.35	.47	.48	3.77	.50	−.40	3.06	.71	−1.49
2. Ego	3.81	.63	.52	3.29	.86	−.09	2.82	.87	−.64	2.80	.49	−.66
3. Incremental	3.95	.46	−.27	4.57	.37	.75	3.84	.49	−.45	3.32	.52	−1.32
4. Entity	3.10	.46	.41	2.59	.75	−.40	2.84	.57	−.01	2.92	.40	.12
5. Sports Competence	3.34	.46	.07	3.66	.59	.56	2.68	.49	−.96	2.72	.42	−.90
6. RAI	4.55	2.47	−.42	8.63	1.69	.78	5.87	1.84	−.03	.04	1.11	−1.74
7. Amotivation	2.25	.87	.47	1.28	.40	−.59	1.48	.53	−.38	3.40	.60	1.72

Table 3
Cluster Means, Standard Deviations, and z Scores for the Four-Cluster Solution using K-Means Cluster Analysis and Criterion Variables

	Cluster 1 ($n = 91$) "Maladaptive Motivated"			Cluster 2 ($n = 113$) "Highly Motivated"			Cluster 3 ($n = 69$) "Low Competence"			Cluster 4 ($n = 21$) "Amotivated"		
	M	**SD**	**z**	**M**	**SD**	**z**	**M**	**SD**	**z**	**M**	**SD**	**z**
Clustering Variables												
1. Task	4.07	.44	.06	4.37	.45	.52	3.86	.46	−.25	3.30	.67	−1.11
2. Ego	3.92	.66	.65	3.39	.82	.03	2.75	.72	−.72	3.05	.68	−.36
3. Incremental	4.01	.44	−.17	4.56	.38	.74	3.88	.48	−.39	3.40	.45	−1.18
4. Entity	3.22	.50	.58	2.56	.68	−.43	2.73	.56	−.17	3.07	.43	−.36
5. Sports Competence	3.36	.47	.11	3.72	.54	.66	2.70	.47	−.92	2.93	.43	−.57
6. RAI	4.72	2.17	−.37	8.65	1.66	.79	6.03	2.01	.02	.69	1.55	−1.55
7. Amotivation	2.20	.79	.42	1.24	.37	−.64	1.55	.53	−.30	3.37	.65	1.68
Criterion Variables												
1. Performance Climate	3.00	.58	.34	2.70	.63	−.14	2.49	.62	−.46	3.10	.44	−.50
2. Mastery Climate	3.96	.44	−.01	4.30	.44	.56	3.79	.53	−.30	3.31	.52	−1.07
3. Enjoyment	3.98	.48	−.11	4.48	.42	.65	3.77	.58	−.41	3.44	.49	−.91
4. Effort	3.75	.48	−.08	4.18	.53	.59	3.60	.51	−.32	3.09	.45	−1.11

Table 4
Cluster Means, Standard Deviations, and Z Scores for the Clustering Variables in the Four-Cluster Solution of the Second K-Means using Random Seed Points

	Cluster 1 "Maladaptive motivated"			Cluster 2 "Highly motivated"			Cluster 3 "Low competence"			Cluster 4 "Amotivated"		
	M	**SD**	**z**	**M**	**SD**	**z**	**M**	**SD**	**z**	**M**	**SD**	**z**
Clustering Variables												
1. Task	4.15	.42	.18	4.26	.47	.35	4.20	.47	.25	3.44	.53	−.90
2. Ego	3.97	.59	.70	3.85	.67	.57	2.73	.66	−.74	2.95	.73	−.48
3. Incremental	3.99	.43	−.19	4.44	.49	.54	4.24	.47	.21	3.55	.46	−.93
4. Entity	3.48	.46	1.00	2.83	.61	−.02	2.43	.53	−.65	2.93	.46	−.13
5. Sports Competence	3.33	.51	.05	3.82	.49	.80	3.01	.54	−.45	2.84	.48	−.70
6. RAI	3.76	2.33	−.65	8.35	1.71	.70	7.25	1.94	.38	2.81	2.11	−.93
7. Amotivation	2.50	.83	.74	1.24	.37	−.64	1.44	.47	−.43	2.61	.83	.86

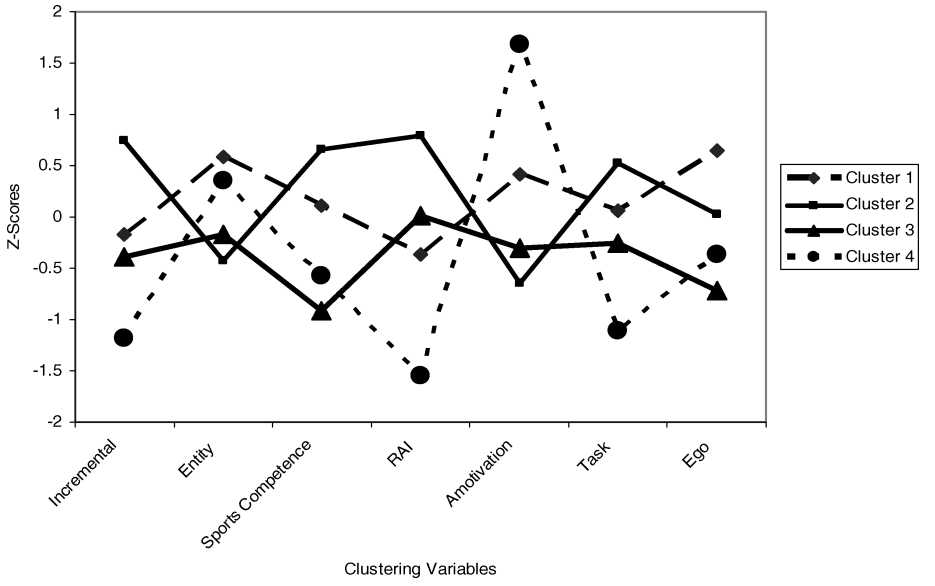

Figure 1. Cluster profiles of the K-means clustering variables for the four-cluster solution.

results revealed that Cluster 3 was significantly lower in their ego orientation and perceived sports competence when compared with "maladaptive motivated" and "highly motivated" groups, respectively (all $ps < .01$). In comparison with the criterion variables (see Figure 2), Cluster 3 showed moderately low z scores in all categories. Its graph line was comparatively flat across all the criterion variables.

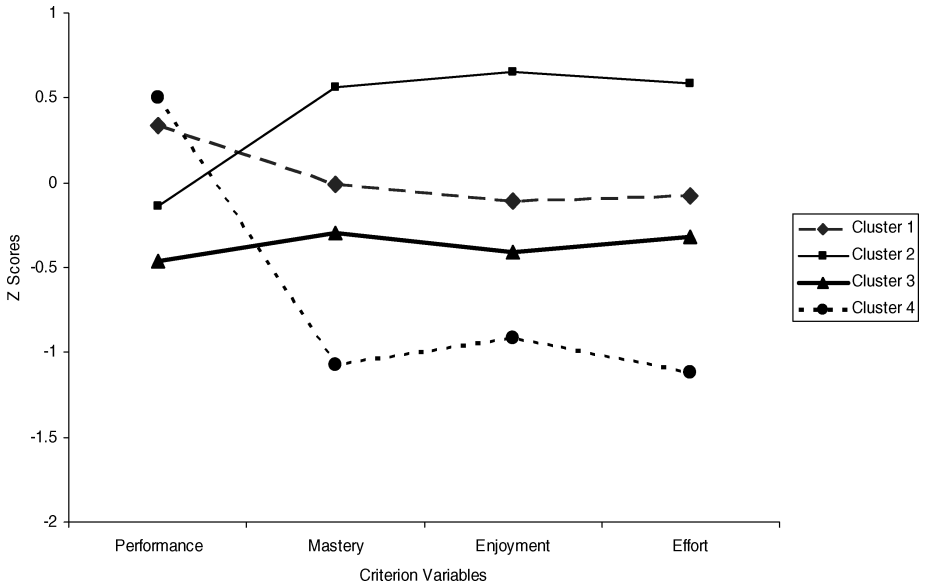

Figure 2. Cluster profiles of the criterion variables for the four-cluster solution.

Cluster 4 ($n = 21$) was labeled as an "amotivated" group. The characteristic of this cluster was high z scores in amotivation, but low in task and ego orientation, incremental ability beliefs, sports competence, and RAI. Post hoc analyses revealed that Cluster 4 showed significantly higher amotivation levels as compared with the rest of the clusters (all ps $< .01$). In addition, Cluster 4 had significantly lower values in task orientation, incremental beliefs, and RAI when compared with the rest of the clusters (all ps $< .01$). In comparison with the "maladaptive motivated" and "highly motivated" groups, perceived sports competence level in Cluster 4 was significantly lower. Furthermore, this cluster also had significantly lower effort and perceived mastery climate as compared with athletes from the remaining three clusters (all ps $< .01$). However, Cluster 4 only contributed to 7.14% of the total sample and hence, the multivariate results needed to be interpreted with caution.

Gender, Amount of Time Spent in Sports Participation, and Nature of Sports Differences in Cluster Composition

To provide a more complete profiling of the cluster groups, variables such as gender and nature of the sports, as well as training duration were included in further analyses. In terms of gender, "maladaptive" and "highly motivated" groups were evenly distributed. However, there was a higher percentage of female athletes in the "low competence" group (65.2%), but a lower percentage of female athletes in the "amotivated" group (23.8%). In terms of nature of sports, Clusters 1, 2, and 3 showed an even distribution for both team and individual sports. In Cluster 4, a higher percentage of athletes were involved in individual sports (61.9%). Finally, more than 50% of the athletes in each cluster spent at least six hours playing sports each week, except for those in Cluster 4 (42.8%). The results of the two-way contingency table analysis showed that the only significant difference was found with the amount of time spent playing sports among the cluster groups, $\chi^2 = (9, N = 290) = 28.11, p = .01$. Unfortunately, 4 of the 16 cells (25.0%) in the contingency table had an expected count of less than five. As a result, further analysis was omitted.

DISCUSSION

The main purposes of the study were to identify the underlying motivational profiles for sport participation among junior college athletes in Singapore and to examine the relationships between motivational profiles identified over a range of cognitive, behavioral, and affective indices. Overall, task and ego orientations were weakly related, supporting the orthogonal nature of the two goals for the Singaporean sample. The relationship is consistent with that found in the Taiwanese sample by Li et al. (1996). Task orientation was also positively associated with adaptive motivational constructs such as incremental sports beliefs, sports competence, and intrinsic motivation.

Congruent with previous research (Harwood et al., 2004; Hodge & Petlichkoff, 2000; Vlachopoulos et al., 2000; Wang & Biddle, 2001; Wang et al., 2002), the present study shows that cluster analysis was able to identify subgroups of athletes with differentiated motivational patterns. Compared to the traditional median- or mean-split procedures that are structure-imposing on the data, cluster analysis may reflect more "realistic" profiles of the sample.

Taking together the present findings and previous research provides ample evidence that motivation is multi-dimensional and cannot simply classified as "high" versus "low" based on a single variable (e.g., Wang & Biddle, 2001). For example, the "highly motivated" group (Cluster 2) had a profile of high task orientation, incremental beliefs, high perceived competence, and RAI, but low in ego orientation, entity beliefs, and amotivation. Results

also found that the "highly motivated" cluster reported high enjoyment, effort, and perceived mastery climate. This cluster had the highest percentage of athletes (73.6%) attaining at least six hours of sports participation per week. Hence, these findings supported our hypothesis on the existence of clusters with more adaptive profiles. From a practical perspective, coaches may want to reinforce these positive motivational patterns among their athletes.

Similar to Hodge and Petlichkoff's (2000) study, the present study did not identify a high task/high ego group in the sample. Instead, four goal profiles were found: moderate task/high ego ("maladaptive motivated" cluster), moderate task/moderate ego ("highly motivated" cluster), moderate task/low ego ("low competence" cluster) and low task/low ego ("amotivated" cluster). Hodge and Petlichkoff (2000) have cautioned that the labels in each cluster are created in relation to the *z* scores and hence, may not correspond with the actual strength of the task orientation when viewed as an absolute mean value.

Congruent with Wang and Biddle's (2001) study, an "amotivated" group was found in the sample. This cluster reported the most maladaptive motivational patterns as predicted. Fortunately, this cluster only represented 7.14% of the total sample. These athletes may perceive no contingency between their training effort and outcome. From a practical perspective, they may have been neglected during training sessions. It is critical that coaches are able to identify these athletes and help them reappraise their current situation in sport.

Based on the present findings, athletes from Cluster 1 ("maladaptive") may require immediate intervention. These athletes reported significantly higher amotivation, as compared with those in Cluster 2 ("highly motivated") and Cluster 3 ("low competence"). In addition, these athletes in Cluster 1 had high ego but low task orientation. Although studies (Duda & Treasure, 2001; Georgiadis et al., 2001) have indicated that high ego orientation is not necessarily maladaptive towards sports motivation, it still needs to be paired with high task orientation. Hodge and Petlichkoff (2000) explained that such a complementary balance will reinforce both a "winning" focus (ego involving) and a "how to win" focus (task involving), especially in the context of sport.

For Cluster 1 ("maladaptive"), perhaps a practical implication that stems from these findings is to create an environment that focuses more on task goals and less on normative ability. By being task involved, athletes focus on attaining the process goals, rather than outcome goals. As competition is an integral part of sports, coaches could consider deemphasizing outcome goals by reducing the importance of results, and concentrate more on task mastery such as learning and improving techniques and skills. Weiss et al. (1997) highlighted it is also important that coaches acknowledge skill errors as part of the learning process. In addition, praising behaviors under the athletes' control such as effort, technique, and individual improvement will foster a mastery climate (Weiss et al., 1997).

The trend found in Cluster 3 ("low competence") was equally worrying. Athletes in Cluster 3 reported lower perceived competence and ego orientations than those in the "maladaptive motivated" and "highly motivated" groups. Such findings are similar to those by Wang and Biddle (2001). Although the athletes from Cluster 3 reported high training duration of at least six hours per week, the training may not be effective at enhancing their perceptions of competence. For the athletes in Cluster 3, perhaps setting clear and realistic targets may help them to gain more successful experiences. By understanding and possessing the relevant skills to succeed, athletes are more likely to adopt and internalize their goals (Ryan & Deci, 2000).

From a practical perspective, coaches may want to give the athletes in Cluster 3 a greater sense of autonomy by actively involving them in training program planning and goal setting. With a clear objective and strong sense of ownership, athletes will be intrinsically motivated to stay focused and achieve their goals. Based on the cross-cultural findings on the universal importance of an autonomy-supportive environment, we believe that the above strategies are

applicable to the Singaporean sample in Cluster 3 (Chirkov et al., 2005; Vansteenkiste et al., 2005).

Future studies need to adopt a longitudinal design to understand the changes in athletes' motivational profiles in sports involvement. In addition, integration refers to integrating the identified values with other aspects of one's self (Deci & Ryan, 1985). This was not included in the PLOC and RAI and in most previous studies. Future studies may want to include this measure to determine its impact. Furthermore, studies designed to compare sub-groups of athletes, for example elite versus recreational athletes, may help to further differentiate the clusters to provide more extreme profiles. Finally, future studies might need to use qualitative approaches, such as in-depth interviews and observations, to gain further insight into participants' motivation. These methods can also serve to triangulate research findings obtained with other approaches.

A major contribution of the present study is that interpretable patterns of motivational profiles were found through the use of cluster analysis in an Asian sample. It highlights the possibility of adopting an integrative theoretical framework to understand the dynamics of sport motivation. From a practical perspective, a multi-theoretical approach provides a robust explanation of the athletes' affective, cognitive, or behavioral changes during training and competitions. Furthermore, targeting a specific population also allows coaches and practitioners to tailor training programs that match their athletes' motivational needs. In conclusion, coaches and practitioners who rely on one or two motivational theories are unlikely to capture the "whole picture" in the motivational process. Instead, this study suggests that with a holistic approach that is based on achievement goals, conceptions of sport ability beliefs, self-determination, and perceived competence it is possible to target interventions to enhance athletes' motivation in sport involvement.

REFERENCES

Aldenderfer, M. S., & Blashfield, R. K. (1984). *Cluster analysis.*. Newbury Park, California: Sage.

Biddle, S. J. H. (2001). Understanding the Dynamics of motivation in physical activity: The influence of achievement goals on motivational processes. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 101–127). Champaign, IL: Human Kinetics.

Biddle, S. J. H., & Mutrie, N. (2001). Motivation through feelings of control. *Psychology of physical activity* (pp. 49–84). London: Routledge.

Biddle, S. J. H., Wang, C. K. J., Chatzisarantis, N. L. D., & Spray, C. M. (2003). Entity and incremental beliefs concerning athletic ability: Measurement and relationships with physical activity motivation in youth. *Journal of Sports Sciences, 21*, 973–989.

Biddle, S. J. H., Wang, C. K. J., Kavussanu, M., & Spray, C. M. (2003). Correlates of achievement goal orientations in physical activity: A systematic review of research. *European Journal of Sport Science, 3*, 1–20.

Boixadós, M., Cruz, J., Torregrosa, M., & Valiente, L. (2004). Relationships among motivational climate, satisfaction, perceived ability and fair play attitudes in young soccer players. *Journal of Applied Sport Psychology, 16*, 301–317.

Chatzisarantis, N. L. D., Hagger, M. S., Biddle, S. J. H., Smith, B., & Wang, C. K. J. (2003). A meta-analysis of perceived locus of causality in exercise, sport, and physical education contexts. *Journal of Sport and Exercise Psychology, 25*, 284–306.

Chirkov, V., Ryan, R. M., & Willness, C. (2005). Cultural context and psychological needs in Canada and Brazil: Testing a self-determination approach to the internalization of cultural practices, identity, and well-being. *Journal of Cross-Cultural Psychology, 36*, 423–443.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour*. New York: Plenum Press.

Duda, J. L. (2001). Achievement goal research in sport: Pushing the boundaries and clarifying some misunderstandings. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 129–182). Champaign, IL: Human Kinetics.

Duda, J. L., & Nicholls, J. G. (1992). Dimension of achievement motivation in schoolwork and sport. *Journal of Educational Psychology, 84*, 1–10.

Duda, J. L., & Treasure, D. C. (2001). Toward optimal motivation in sport: Fostering athletes' competence and sense of control. In J. Williams (Ed.), *Applied sport psychology* (4th ed., 43–62). Mountain View, CA: Mayfield Press.

Duda, J. L., & Whitehead, J. (1998). Measurement of goal perspectives in the physical domain. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 21–48). Morgantown, WV: Fitness Information Technology.

Dweck, C. S. (1999). *Self-theories: Their roles in motivation, personality and development*. Philadelphia: Taylor & Francis.

Dweck, C. S., & Leggett, E. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256–273.

Etnier, J. L., Sidman, C. L., & Hancock, II. L. C. (2004). An examination of goal orientation profiles and motivation in adult team sport. *International Journal of Sport Psychology, 35*, 173–188.

Fox, K. R. (1990). *The Physical Self-Perception Profile manual*. DeKalb, IL: Office for Health Promotion, Northern Illinois University.

Georgiadis, M., Biddle, S. J. H., & Anweele, Y. V. (2001). Cognitive, emotional, and behavioural connotations of task and ego goal orientation profiles: An ideographic approach using hierarchical class analysis. *International Journal of Sport Psychology, 32*, 1–20.

Goudas, M., Biddle, S. J. H., & Fox, K. (1994). Perceived locus of causality, goal orientation, and perceived competence in school physical education classes. *British Journal of Educational Psychology, 64*, 453–463.

Green, S. B., & Salkind, N. J. (2003). *Using SPSS for windows and Macintosh: Analyzing and understanding data* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Kim, B., & Gill, D. (1997). A cross-cultural extension of goal perspective theory to Korean youth sport. *Journal of Sport & Exercise Psychology, 19*, 142–155.

Hair, J. F. J., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Englewood Cliffs, NJ: Prentice-Hall International.

Harwood, C., Cumming, J., & Fletcher, D. (2004). Motivational profiles and psychological skills use within elite youth sport. *Journal of Applied Sport Psychology, 16*, 318–332.

Heine, S. J. (2003). An exploration of cultural variation in self-enhancing and self-improving motivations. In V. Murphy-Berman, & J. J. Berman (Eds.), *Nebraska Symposium on Motivation: Vol. 49. Cross-cultural differences in perspectives on the self* (pp. 1–57). Lincoln, NE: University of Nebraska Press.

Hodge, K., & Petlichkoff, L. (2000). Goal profiles in sport motivation: A cluster analysis. *Journal of Sport and Exercise Psychology, 22*, 256–272.

Iyengar, S. I., & DeVoe, S. E. (2003). Rethinking the value of choice: Considering cultural mediators of intrinsic motivation. In V. Murphy-Berman, & J. J. Berman (Eds.), *Nebraska Symposium on Motivation: Vol. 49. Cross-cultural differences in perspectives on the self* (pp. 129–176). Lincoln, NE: University of Nebraska Press.

Li, F. (1999). The Exercise Motivation Scale: Its multifaceted structure and construct validity. *Journal of Applied Sport Psychology, 11*, 97–115.

Li, F., Harmer, P., Chi, L., & Vongjaturapat, N. (1996). Cross-cultural validation of the Task and Ego Orientation in Sport Questionnaire. *Journal of Sport & Exercise Psychology, 18*, 392–407.

McAuley, E., Duncan, T. E., & Tammen, V. V. (1989). Psychometric properties of the intrinsic motivation inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise & Sport, 60*, 48–58.

Mullen, E., Markland, D., & Ingledew, D. K. (1997). A graded conceptualization of self-determination in the regulation of exercise behavior: Development of a measure using confirmatory factor analysis. *Personality and Individual Differences, 23*, 745–752.

Newton, M. L., Duda, J. L., & Yin, Z. (2000). Examination of the psychometric properties of the Perceived Motivational Climate in Sport Questionnaire-2 in a sample of female athletes. *Journal of Sports Sciences, 18*, 275–290.

Nicholls, J. G. (1989). *The competitive ethos and democratic education.*. Cambridge, MA: Harvard University Press.

Ntoumanis, N. (2001). Empirical links between achievement goal theory and self-determination in sport. *Journal of Sports Sciences, 19*, 397–409.

Oishi, S. (2000). Goals as cornerstones of subjective well-being: Linking individuals and cultures. In E. Diener, & E. M. Suh (Eds.), *Culture and subjective well-being* (pp. 87–112). Cambridge, MA: Bradford.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Briere, N. M., & Blais, M. S. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The Sports Motivation Scale (SMS). *Journal of Sport and Exercise Psychology, 17*, 35–53.

Petherick, C. M., & Weigand, D. A. (2002). The relationship of dispositional goal orientations and perceived motivational climates on indices of motivation in male and female swimmers. *International Journal of Sport Psychology, 33*, 218–237.

Roberts, G. C. (2001). Understanding the Dynamics of motivation in physical activity: The influence of achievement goals on motivational processes. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 1–50). Champaign, IL: Human Kinetics.

Rothbaum, F., Weisz, J., Pott, M., Miyake, K., & Morelli, G. (2000). Attachment and culture: Security in the United States and Japan. *American Psychologist, 55*, 1093–1104.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization. *Journal of Personality and Social Psychology, 5*, 749–761.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classical definitions and new directions. *Contemporary Educational Psychology, 25*, 54–67.

Ryan, R. M., & Deci, E. L. (2002). An overview of self-determination theory: An organismic-dialectical perspective. In E. L. Deci, & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3–33). Rochester, NY: University of Rochester Press.

Standage, M., Duda, J. L., & Ntoumanis, N. (2003). Predicting motivational regulations in physical education: the interplay between dispositional goal orientation, motivational climate and perceived competence. *Journal of Sports Sciences, 21*, 631–647.

Tseng, V. (2004). Family interdependence and academic adjustment in college: Youth from immigrant and U.S.-born families. *Child Development, 75*, 966–983.

Vallerand, R. J., & Fortier, M. S. (1998). Measures of intrinsic and extrinsic motivation in sport and physical activity: A review and critique. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 81–101). Morgantown, WV: Fitness Information Technology.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C., & Vallieres, E. F. (1992). The Academic Motivation Scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement, 52*, 1003–1017.

Vallerand, R. J., & Rosseau, F. L. (2001). Intrinsic and extrinsic motivation in sport and exercise: A review using the hierarchical model of intrinsic and extrinsic motivation. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* 2nd Eds., pp. 389–416). New York: Wiley.

Vansteenkiste, M., Zhou, M., Lens, W., & Soenens, B. (2005). Experiences of autonomy and control among Chinese learners: Vitalizing or immobilizing? *Journal of Educational Psychology, 97*, 468–483.

Vlachopoulos, S. P., Karageorghis, C. I., & Terry, P. C. (2000). Motivational profiles in sport: A self-determination perspective. *Research Quarterly for Exercise and Sport, 71*, 387–397.

Wang, C. K. J., & Biddle, S. J. H. (2001). Young people's motivational profiles in physical activity: A cluster analysis. *Journal of Sport and Exercise Psychology, 23*, 1–22.

Wang, C. K. J., Chatzisarantis, N. L. D., Spray, C. M., & Biddle, S. J. H. (2002). Achievement goal profiles in school physical education: Differences in self-determination, sport ability beliefs, and physical activity. *British Journal of Educational Psychology, 72*, 433–445.

Wang, C. K. J., Liu, W. C., Biddle, S. J. H., & Spray, C. M. (2005). Cross-cultural validation of the Conceptions of the Nature of Athletic Ability Questionnaire Version 2. *Personality and Individual Differences, 38*, 1245–1256.

Weiss, M. R., Ebbeck, V., & Horn, T. (1997). Children's self-perceptions and sources of physical competence information: A cluster analysis. *Journal of Sport and Exercise Psychology, 19*, 52–70.