Original Article

SPORT ABILITY BELIEFS, ACHIEVEMENT GOALS, SELF-DETERMINATION AND BELIEFS ABOUT THE PURPOSES OF PHYSICAL EDUCATION AMONG SINGAPOREAN PRESERVICE PHYSICAL EDUCATION TRAINEES

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The purpose of this study was to examine preservice PE trainees' beliefs about the nature of sport ability, achievement goals, perceptions of autonomy, and the relationships with their beliefs about the purposes of PE in Singapore. Two hundred and nineteen participants took part in this study. Cluster analysis revealed three distinct clusters differed significantly in their beliefs about the purposes of physical education. The 'High Incremental / High Competent' group had significantly higher scores in their beliefs that the purposes of PE are to teach students knowledge about health and fitness, and more general personal growth, including how to become good citizens. In contrast, the 'High Entity / Low Autonomy' cluster had significantly higher scores in beliefs that the purposes of PE were to enhance social status and competition, compared to the 'Low Entity / High Autonomy' cluster and significantly lower scores in beliefs that the purposes of PE were to teach students to strive for excellence compared to the 'Low Entity/ High Autonomy' cluster. The results in the present study showed that preservice PE teachers' belief about sport ability, achievement goals, and perceived autonomy help build a meaningful framework to understand their beliefs about the purposes of PE.
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Introduction

There are concerns that the habitual physical activity of the average child has decreased greatly with the advancement in computer technology and entertainment (Chia, Wang, Teo-Koh, Quek, & Gosian, 2002; Pate *et al.*, 1997; Robinson *et al.*, 1993; Wang, Chia, Quek, & Liu, 2006). At the same time, a well documented rise on obesity has coincided in many countries (Biddle, Sallis, & Cavill, 1998; Sallis *et al.*, 1992). According to the American Association of Obesity (2006), the prevalence of obesity has increased by about 10% to 40% in the many European countries over the last 10 years. In addition, many South-East Asian countries are presently undergoing a "nutrition transition" involving a shift in the structure of diet, decreased physical activity and rapid increases in the prevalence of obesity. Therefore, understanding the 'why' of people exercising and not exercising becomes an important area of study for physical education researchers. In this study, the researchers investigate the sport belief system, achievement goals, motivational regulations and

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perceptions of the purposes of PE among a group of preservice PE trainees who have enrolled in a teacher training course in Singapore. Drawing from multiple perspectives of motivation theories has the potential to guide practices and interventions aim at promoting physical activity participation. Wang and Biddle (in press) have shown that integrating these theoretical perspectives could provide a comprehensive explanation of peoples' physical activity behaviour.

Sport Ability Beliefs

People's lay theories or beliefs provide a pivotal role in interpreting the world (Kelly, 1955). Dweck and her colleagues (Dweck, Chiu, & Hong, 1995) propose that individuals' implicit theories about human attributes would structure the way they interpret and understand human behaviour. These implicit theories have been useful in understanding achievement behaviour in recent years. In Dweck's (1986) implicit theory of intelligence, she proposes that people with an 'entity' theory of intelligence are more likely to set ego-oriented (performance) goals as a way to display that entity. When faced with setbacks, people with entity theory of intelligence set performance goals and exhibit a maladaptive motivational pattern, characterised by negative cognitions, negative affect and a sharp decline in performance. In contrast, people with an 'incremental' theory of intelligence have a greater tendency to set task-oriented (learning) goals. For these people, intelligence is seen as malleable, controllable and

changeable. They set learning goals and demonstrate more adaptive patterns, characterised by positive thoughts, positive affect, and effective problem-solving strategies (Dweck, 1986, 1999; Dweck & Leggett, 1988; Heyman & Dweck, 1992).

Dweck and her colleagues have extended the study of implicit theories into the areas of personality, stereotyping, and moral judgements (e.g., Chiu, Dweck, Tong, & Fu, 1997; Chiu, Hong, & Dweck, 1997; Dweck *et al.*, 1995) and, more recently, integrated attribution theory such that implicit theories create a meaningful framework for the occurrence of attributions (Hong, Chiu, Dweck, Lin, & Wan, 1999). These studies have shown that people's implicit theories about the fixedness versus malleability of human attributes predict differences in degree of social stereotyping, moral judgement, and attribution. For example, Hong et al. (1999) found that entity belief in human character is linked to a likelihood of making static judgements or trait-related judgement.

There has also been increasing attention gained in the physical activity domain in implicit theories. A number of studies conducted in the sport or exercise contexts generally yield consistent results (e.g., Biddle, Soos, & Chatzisarantis, 1999; Biddle, Wang, Chatzisarantis, & Spray, 2003; Cury, Da Fonseca, Rufo, & Sarrazin, 2002; Sarrazin *et al.*, 1996; Spray, Wang, Biddle, Chatzisarantis, & Warburton, 2006). For example, Biddle *et al.* (1999) found that an entity belief predicted an ego orientation and an incremental belief predicted a task orientation, in addition, intentions to participate in sport were predicted by goal orientations through perceived competence. The evidence, taken together, suggests that differences in the beliefs of sport ability underpin the adoption of achievement goals.

Achievement Goal Theory

There are two major types of achievement goals, namely task (learning) and ego (performance) exist (Dweck, 1999; Dweck & Leggett, 1988; Nicholls, 1989). These two achievement goals reflect how people define success. A task-oriented person is more likely to define success or competence in terms of mastery or task improvement. He or she tends to adopt a personal criterion of evaluation. In contrast, an ego-oriented person is more likely to define success or competence in normative terms, that is, through winning or outperforming others. Biddle and his colleagues (Biddle, Wang, Kavussanu, & Spray, 2003) captured the essences of 10 correlates of achievement goal orientations in sport and physical activity contexts across 98 studies and 110 independent samples (total N = 21,076) and found that a task orientation is associated with the belief that the purpose of sport is to promote mastery and the values of effort exertion, enhance social responsibility, as well as encourage lifetime participation. Ego orientation has been linked to the belief that sport is a means of enhancing one's status and recognition and all studies reviewed supported this. Two studies investigating the purposes of school PE were also consistent with those from the

competitive sport domain (Papaioannou & McDonald, 1993; Walling & Duda, 1995). Although the links between achievement goals and perceived purposes of sport and school PE have been established, the relationships between sport ability beliefs and beliefs about the purposes of sport and physical education have not been explicitly studied. Hence, this study will examine the relationships between sport ability beliefs and beliefs about the purposes of PE, together with achievement goals and behavioural regulations.

Self-Determination Theory

Sport ability beliefs and achievement goals have been linked to behavioural regulation in a few recent studies to yield a more comprehensive understanding of motivation (Biddle et al., 2003; Spray et al., 2006; Wang & Biddle, 2001). For example, in Wang and Biddle's study (2001), it was found that students in the 'self-determined' or 'highly motivated' groups had high incremental beliefs, high perceived competence and low amotivation. The 'amotivated' group, on the other hand, showed low task orientation, low incremental beliefs, high entity beliefs, low perceived competence, low physical activity, and low perceived self-worth. These studies provide evidence that integrating sport ability beliefs, achievement goals, and behavioural regulation could provide a more comprehensive understanding of motivation.

The notion of behavioural regulation originated from Self-determination theory (SDT). It is an organismic theory of motivation that accounts for psychological needs and motives (Deci & Ryan, 1985; Ryan & Deci, 2000). The psychological needs include the needs of autonomy, competence and relatedness (social needs). The need for autonomy is defined as the need to feel ownership of one's behaviour. The need for competence refers to the need for producing desired outcomes and to experience mastery and effectiveness (Deci, Vallerand, Pelletier, & Ryan, 1991). The need for relatedness is the need to feel that one can relate to others and with the social world in general (Ryan, 1993). People are motivated to satisfy these needs because it is essential for the development of self. When autonomous, people experience choice and freedom in their actions, which is characterized by an absence of external pressures (Deci & Ryan, 1987). On the other hand, when a person is compelled to do certain things, that is, when the behaviour is not self-determined, the person is controlled. In SDT, it is proposed that when the needs for autonomy, competence and relatedness are satisfied, intrinsic motivation will increase, if not, intrinsic motivation will be undermined.

In SDT, behavioural regulation identifies qualitatively distinct sources of motivation that impact how persons engage in and experience activities. Ryan and Connell (1989) also suggest that there are four main types of behavioural regulations central to self-determination theory, each one reflecting a qualitatively different 'reason' for acting out the behaviour in question. They are external regulation, introjected regulation, identification and

intrinsic motivation. External regulation refers to behaviour that is controlled by external means such as rewards or external authority. Introjected regulation refers to behaviour that is internally controlling or self-imposed, such as acting out feelings of guilt avoidance, and is characterised by feeling of 'ought to'. When identified, the behaviour is self-determined according to one's choice or values. It is characterised by feelings of 'want to' rather than 'ought to'. Finally, intrinsically motivated behaviour is behaviour that is solely for its own sake or enjoyment. These four behavioural regulations can be assessed by using the Perceived Locus of Causality scale (PLOC; Ryan & Connell, 1989). The four regulations form a continuum which characterises the degree of internalisation of the behaviour (Deci et al., 1991). In addition, based on the study of Ryan and Connell (1989), Goudas, Biddle and Fox (1994) showed that an overall relative autonomy index (RAI) can be calculated by weighting each subscale to indicate the level of autonomy (see method section).

Research has shown the motivational benefits of more self-determined behavioural regulations in classroom (e.g., Connell & Wellborn, 1991; Grolnick & Ryan, 1987; Ryan & Connell, 1989; Vallerand & Bissonnette, 1992), as well as in physical activity contexts with young people (Chatzisarantis et al., 1997; Goudas et al., 1994). In Ryan and Connell's (1989) study, external and introjected regulations in school children were related to anxiety and maladaptive behaviour when faced with failures. On the other hand, identified regulation and intrinsic motivation were positively related to enjoyment and effort.

Wang and Biddle (2001) found that differences in sport ability beliefs, goal orientation and perceived autonomy predicted difference levels of self-worth and physical activity participation. For example, children with high incremental beliefs about sport ability and high perceptions of autonomy tend to have higher perceived physical self-worth and more active compared to those with low incremental beliefs.

In sum, almost all the studies examined sport ability beliefs, achievement goals, and behavioural regulation from the pupils' perspective. One of the key persons in the physical education context is the physical educator, and this group has been largely ignored. PE teachers are responsible for providing children with quality PE. They should be role models for their students and should be chosen based on their effectiveness and commitment to the profession (McCullick, 2001). Precisely, PE teachers spend most of their professional time in school interacting with students or sport teams and can have a positive influence on them. For example, if a PE teacher believes that effort is more important than ability in defining success, he or she will emphasize on the mastery and improvement of skills rather than ability in his or her lessons (Goudas & Biddle, 1994). This in turn may lead children to define success in terms of effort (or involvement) rather than ability.

The values and beliefs that preservice PE trainees hold may determine the way they deliver their lessons in class (Siedentop & Tannehill, 2000). These may also influence what they learn and regulate how they learn and in their physical education teacher education (PETE). Therefore, understanding their beliefs and motivational characteristics may help teacher educators to build on these in PETE.

This paper attempts to examine the variations in preservice PE trainees' beliefs about the nature of sport ability, achievement goals, perceptions of autonomy, and beliefs about the purposes of PE. As no previous studies have been conducted in this context, no hypotheses were formulated. We assume that subgroups of preservice PE trainees with distinctive profiles based on these motivational constructs will be found and there are variations in their beliefs about the purposes of PE.

Methods

Participants and Procedure
Two hundred and nineteen preservice physical education trainees (n=155 males, n=62 females, 2 missing) who enrolled in a post-graduate diploma in physical education course in Singapore were invited to take part in this study. The questionnaires were in a quiet classroom and took about 15 minutes to complete. The majority of participants were athletes whom previously represented their high schools or universities in their sport (80%). Only 20% of the participants were non-athletes. The age ranged from 18 to 50 years (m=24.35, sd=4.79). Participants were informed that there were no right or wrong answers, assured of the confidentiality of their responses, and encouraged to ask questions if necessary. The procedure for conducting this study was cleared by the university's ethical review committee.

Measures
Goal orientations. The participants' goal dispositions in sport were assessed by the Perception of Success in Sport Questionnaire (POSQ; Roberts, Treasure, & Balague, 1998). The stem for all items was, "I feel most successful in sport when ...", and participants responded on a 5-point Likert scale (1= strongly disagree to 5= strongly agree). There were six items measuring task orientation (e.g., "I work hard") and six items assessing ego orientation (e.g., "I outperform my teammates"). Cronbach's alpha coefficients for task and ego orientations were .81 and .86, respectively.

Sport ability beliefs. The 'Conceptions of the Nature of Athletic Ability Questionnaire, Version Two' (CNAAQ-2; Biddle et al., 2003; Wang & Biddle, 2001) was employed to examine incremental and entity beliefs. 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 measured using six items (e.g., 'it is difficult to change how good you are in sport'). Responses were made on 5-point scales.

These two dimensions of ability beliefs yielded satisfactory internal consistency (Cronbach's alpha coefficients were both .78).

Relative autonomy index (RAI). The Perceived Locus of Causality (PLOC) scale developed by Goudas et al. (1994) was used to assess four types of regulatory styles in the sport context. The stem for all items was 'I take part in sport...'. 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') were assessed through four items each. Identified regulation (e.g., 'because I want to improve in sport) and intrinsic regulation (e.g., 'because sport is fun') were measured through three items each. Responses were also made on 5-point scales similar to the CNAAQ-2. An overall relative autonomy index (RAI) was calculated by using the following procedure: external regulation x (-2) + introjected regulation x (-1) + identified regulation x (1) + intrinsic regulation x (2). This serves as an indicator of a person's motivational regulation, with positive scores indicating more autonomous regulation (i.e., self-determined) and negative scores more controlling regulation. The alpha coefficients were .71 for external regulation, .67 for introjection, .78 for identification, and .77 for intrinsic motivation. The low alpha for introjection is found to be typically below .70 in previous studies (e.g., Wang & Biddle, 2001, Spray & Wang, 2001).

Perceived sport competence. The Sport Competence items from the Physical Self-Perception Profile (PSPP; Fox & Corbin, 1989) were administered. Responses were also given on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). This instrument has become a popular measure of individuals' perceptions regarding their ability and confidence to join sporting activities, and, in the present study, was shown to be internally reliable (= .79).

Perceived purposes of physical education questionnaire. Participants' perceptions of purposes of physical education were determined using an 30-item adapted version of the Perceived Purposes of Sport Questionnaire (PPSQ; McNeill & Wang, 2005) from Duda (1989). The stem of the questions was "A very important thing that Physical Education lesson should do is to ...". The adapted PPSQ consisted of four subscales including: social status (10 items; e.g. "...give students the chance to feel like a champion"), health and fitness (7 items; e.g., "...teach students how to keep themselves fit"), competition (5 items; e.g., "...prepares students for a life in which 'winning is everything'"), and becoming a good citizen (8 items; e.g., "... make us responsible law-abiding citizens"). Two additional subscales, striving for excellence and overall development were added because these were considered as the main objectives of physical education in Singapore (MOE, 1999). The subscale, striving for excellence consisted of 4 items (e.g., "... teach students to keep working in spite of obstacles") and overall development of students had 6 items (e.g., "I feel that PE is great for children to develop social skills, such as sharing equipment, taking turns, and cooperating with classmates"). Responses were made on a 5-point Likert scale as above. The internal

consistency coefficients were satisfaction for the 6 subscales (social status, (=.76; health and fitness, (=.90; competition, (=.77; becoming a good citizen, (=.72; striving for excellence, (= .78; and overall development of students, (= .86).

Data Analysis

The reliability coefficients of all the subscales used in the study were calculated using Cronbach's alphas. Next, basic descriptive statistics such as means, standard deviations and correlations were computed. Previous studies (e.g., Wang & Biddle, 2001) have shown that differences between gender and athletic status exist in levels of the key variables. Therefore, we conducted two separate two-way MANOVAs to examine whether there were main effects on gender and athletic status on the main variables. The first MANOVA used sports ability beliefs, goal orientations, perceived competence and RAI as dependent variables. The second MANOVA used the six subscales of the PPSQ as dependent variables. Follow-up ANOVAs were conducted.

The next stage of the analysis was to identify homogenous groupings of participants with distinct patterns of sport ability beliefs, perceived competence, and RAI. A hierarchical cluster analysis was conducted using SPSS for Windows (Version 14). Four variables were used to classify students into homogenous groups: sport ability beliefs (incremental and entity), RAI, and perceived competence. Before the cluster analysis, all the main variables were standardized using Z scores (m=0, sd=1). This is a necessary step to prevent variables measured in larger units from contributing more towards the distance measured than the variables utilizing smaller units (Everitt, 1993). RAI has a typical range of -12 to 12 due to the weighting of the different subscales, compared to other measures with range from 1 to 5.

Ward's method was used as the clustering method as this method minimises the within-cluster differences and avoids problems with forming long, snake-like chains found in other methods such as the single-linkage procedure (Aldenderfer & Blashfield, 1984). The agglomeration schedule and dendrogram were used to identify the number of clusters.

After the clusters have been found, the two achievement goals were used to validate the motivational adaptively of the clusters. To examine whether these three clusters differed in their beliefs on the purposes of PE, a one-way MANOVA and follow-up ANOVAs were conducted using the six beliefs of the purposes of PE as dependent variables and the clusters as the independent variable. Post-hoc tests using Tukey's Honestly Significant Difference (HSD) were conducted to examine the pairwise comparison between the three clusters.

Results

Descriptive Statistics

The means, standard deviations and correlations between key variables of the overall sample are presented in Table 1. Overall, the participants held high incremental beliefs, low entity beliefs, and they also had high task orientation, high perceived competence, and high RAI towards sport. They believed that PE should contribute to the overall development of the child, should teach students to strive for excellence, and teach them how to keep their bodies healthy and fit. In addition, they also felt that PE can help students gain social status and to become good citizens. Incremental beliefs were positively related to task orientation, RAI, and beliefs that the purposes of PE were to teach students health and fitness, to encourage them to strive for excellence, and contribute to their overall development. Entity beliefs, on the other hand, were positively associated with ego orientation, and negatively linked to RAI and incremental beliefs, and the beliefs that purposes of PE were to teach students strive for excellence and contribute to the child's overall development. RAI was positively related task orientation, and beliefs that the purposes of PE were to teach students health and fit, strive for excellence, and contribute to the overall development of the child.

The first MANOVA dealt with sports ability beliefs, goal orientations, perceived competence and RAI. The results showed significant multivariate effects on athletic status, Wilk's (= .935, F (6, 194) = 2.25, p < 0.05, (= .07), but no gender main nor interaction effects. Follow-up ANOVAs revealed that athletes and non-athletes differed significantly in ego orientation and perceived competence (both ps < .05). Post-hoc tests using Tukey's HSD revealed

that athletes had higher ego orientation (m=3.15, sd= .82, for athletes, m=2.80, sd=.78, for non-athletes) and perceived competence (m=3.55, sd=.66, for athletes, m=3.23, sd=.67, for non-athletes) compared to non-athletes. In terms of the beliefs in the purposes of PE, gender and athletic status did not have any main effects and interaction effects on each of the six subscales. Since the effect sizes for athletic status were small, further analyses were conducted using one single group.

Cluster Analysis

Table 2 shows the agglomeration schedule for the last six stages of the hierarchical cluster analysis and percentage changes in coefficient to the next level. The clustering coefficient shows the first large increase (22.9%) when three clusters merged to two clusters. This implies that two dissimilar clusters are joined (Hair, Anderson, Tatham, & Black, 1998). Therefore, a three-cluster solution was found suitable.

Table 2. Analysis of Agglomeration Coefficients for Hierarchical Cluster Analysis

Number of Clusters	Agglomeration Coefficient	% Change in Coefficient to Next Level
6	385.84	-
5	428.73	11.1
4	472.80	10.3
3	548.95	16.1
2	675.01	22.9
1	863.92	28.0

Table 1. Descriptive Statistics and Intercorrelations between Variables (Overall Sample)

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Incremental	4.22	0.56											
2. Entity	2.64	0.69	-.18**										
3. Task orientation	4.50	0.50	.34**	.11									
4. Ego orientation	3.09	0.82	.08	.21**	.10								
5. Perc. Competence	3.53	0.65	.19**	.07	.27**	.38**							
6. RAI	8.23	2.56	.35**	-.32**	.45**	-.21**	.09						
7. Social Status	3.36	0.77	.02	.19**	.15*	.34**	.29**	.04					
8. Competition	2.81	0.83	.00	.10	.11	.45**	.28**	-.08	.54**				
9. Good Citizens	3.52	0.79	.17*	-.07*	.27**	.08	.20**	.18*	.36**	.24**			
10. Health & Fitness	4.44	0.51	.41**	-.06	.38**	.01	.28**	.37**	.27**	.05	.47**		
11. Excel	4.25	0.55	.40**	-.21**	.44**	.03	.15*	.39**	.29**	.02	.29**	.47**	
12. Overall	4.58	0.48	.52**	-.20**	.46**	-.07	.22**	.55**	.29**	.12	.41**	.56**	.51**

Note. * p < .05; ** p < .01

The cluster size, means, standard deviations, and z-scores of the three clusters are shown in Table 3. Figure 1 shows the graphical representation of the three cluster profiles. Z scores of +/-0.5 or greater were used as criteria to describe whether a group scored relatively 'high' or 'low' in comparison to their peers.

The first cluster can be labelled as the 'High Incremental/ High Competent' group. There were 81 participants in this cluster (37.1%). The characteristics of this cluster were that they had high incremental beliefs, high perceived competence and high RAI. They tended to have above average entity beliefs.

The second cluster had distinctively low entity beliefs and low perceived competence, that is, they believed that sport ability is not fixed, and they perceived themselves to be incompetent in sport. However, they had relatively high RAI score and average incremental beliefs. This cluster was labelled as 'Low Entity/High Autonomy' group and consisted of 78 participants (35.8%).

The final cluster can be labelled as the 'High Entity / Low Autonomy' group. There were 58 participants in this cluster (26.6%). The characteristics of this cluster were that they had very high entity beliefs and very low incremental beliefs and RAI. Perceived competence was at a moderate level.

In order to check the extent of motivational adaptivity of the three clusters, the two goal orientations, namely, task and ego orientation were not used as the cluster variables, but to plot alongside with the four main variables (see Figure 1). The 'High Incremental/ High Competent' cluster

Table 3. Cluster Means, Standard Deviations, and Z Scores for the Three-Cluster Solution

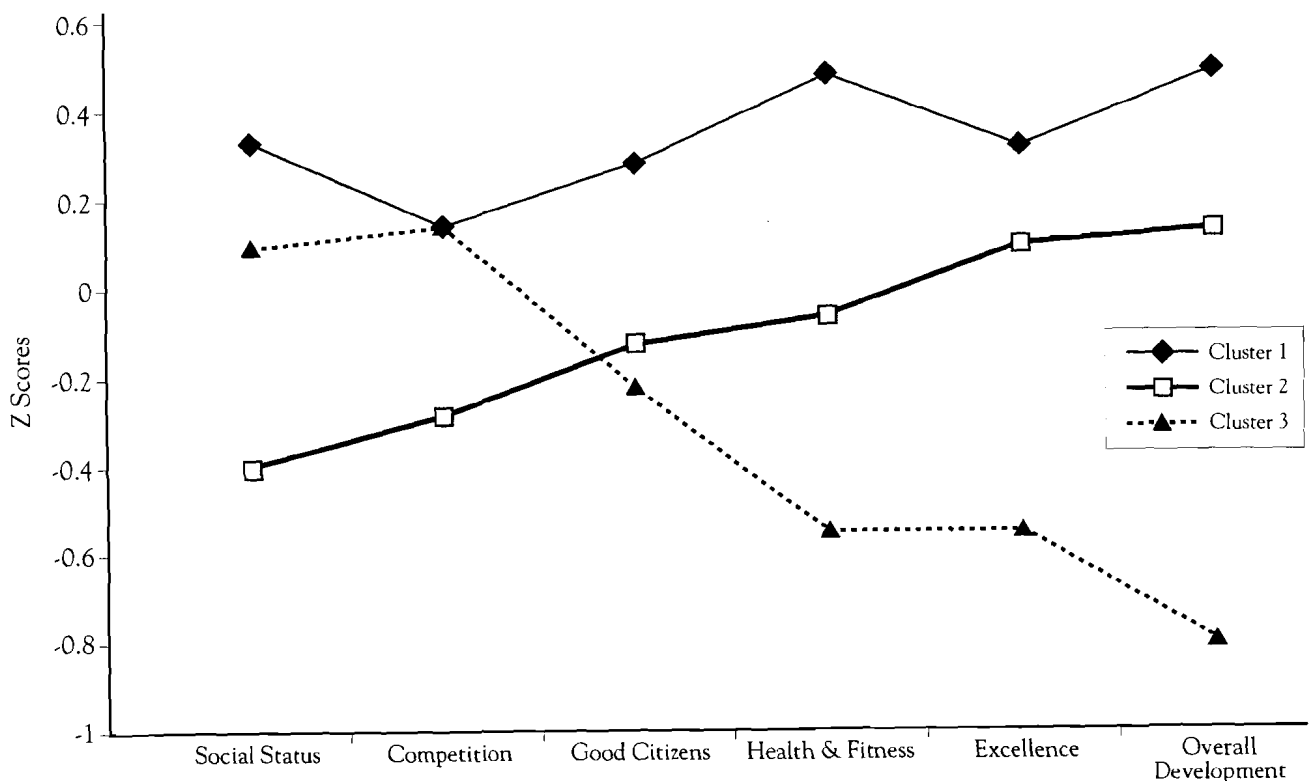| Variable	Cluster 1 (N = 81)			Cluster 2 (N = 78)			Cluster 3 (N = 58)		
	Mean	SD	Z	Mean	SD	Z	Mean	SD	Z
Incremental	4.49	0.40	.49	4.26	0.53	.08	3.78	0.55	-.77
Entity	2.75	0.59	.16	2.15	0.59	-.71	3.13	0.51	.71
Perceived Competence	4.02	0.46	.75	3.04	0.59	-.75	3.50	0.43	-.04
RAI	9.36	1.40	.44	9.18	1.58	.37	5.34	2.68	-1.13
Task Orientation	4.73	0.30	.46	4.50	0.50	-.00	4.20	0.54	-.62
Ego Orientation	3.35	0.79	.31	2.62	0.79	-.57	3.35	0.61	.31

Fig 1. Cluster profiles identified by hierarchical cluster analysis.

* Note. Cluster 1 = High Incremental/High Competent, Cluster 2 = Low Entity/High Autonomy, Cluster 3 = High Entity/Low Autonomy.

(Cluster 1) was found to have high task and ego orientations. The 'Low Entity/High Autonomy' cluster had average task orientation but very low ego orientation. The final cluster, which was the 'High Entity/ Low Autonomy' cluster, had low task and high ego orientations. In terms of motivational adaptive of the goal profiles, the 'High Incremental/High Competent' was the most adaptive in terms of motivation and the 'High Entity/ Low Autonomy' group was the worst, among the three clusters.

The results of the one-way MANOVA showed significant differences between the three clusters on the dependent measures [Pillai's Trace = .405, F (12, 412) = 8.71, p< .001, (=.20]. Test of between-subjects effects indicated significant differences existed for all six beliefs. The results are presented in Table 4 with the means and standard deviations of the dependent variables for the three clusters.

Results of the post-hoc Tukey's tests showed that the 'High Incremental/High Competent' group had significant higher scores in their beliefs that the purposes of PE were to teach students the importance of health and fitness, become good citizens, and to contribute to the overall development of the child compared to the other two clusters (all ps <.05). The 'High Incremental/High Competent' cluster also had significantly higher scores in beliefs that the purposes of PE were to enhance social status and competition, compared to the 'Low Entity/High Autonomy' cluster (all ps < .05). In contrast, the 'High Entity/Low Autonomy' cluster had significantly higher scores in beliefs that the purposes of PE were to enhance social status and competition, and significantly lower scores in beliefs that the purposes of PE were to teach students to strive for excellence, compared to the 'Low Entity/High Autonomy' (all ps < .05).

Table 4. Cluster Profile and Beliefs about the Purposes of PE

Variable	Cluster 1 (N = 81)			Cluster 2 (N = 78)			Cluster 3 (N = 58)		
	Mean	SD	Z	Mean	SD	Z	Mean	SD	Z
Social Status	3.60 a	.65	.32	3.06 b	.87	-.40	3.43 a	.62	.09
Competition	2.94 a	.85	.15	2.59 b	.84	-.29	2.94 b	.66	.16
Good Citizens	3.74 a	.73	.27	3.41 b	.92	-.14	3.35 b	.61	-.21
Health & Fitness	4.68a	.29	.47	4.40b	.65	-.06	4.16 c	.38	-.55
Excellence	4.43 a	.47	.32	4.29 a	.56	.08	3.95 b	.51	-.56
Overall Development	4.80 a	.31	.47	4.63 b	.41	.11	4.19 c	.53	-.79

Note: Means in the same row that do not share subscripts differ at p < .05 in the Tukey HSD comparison.
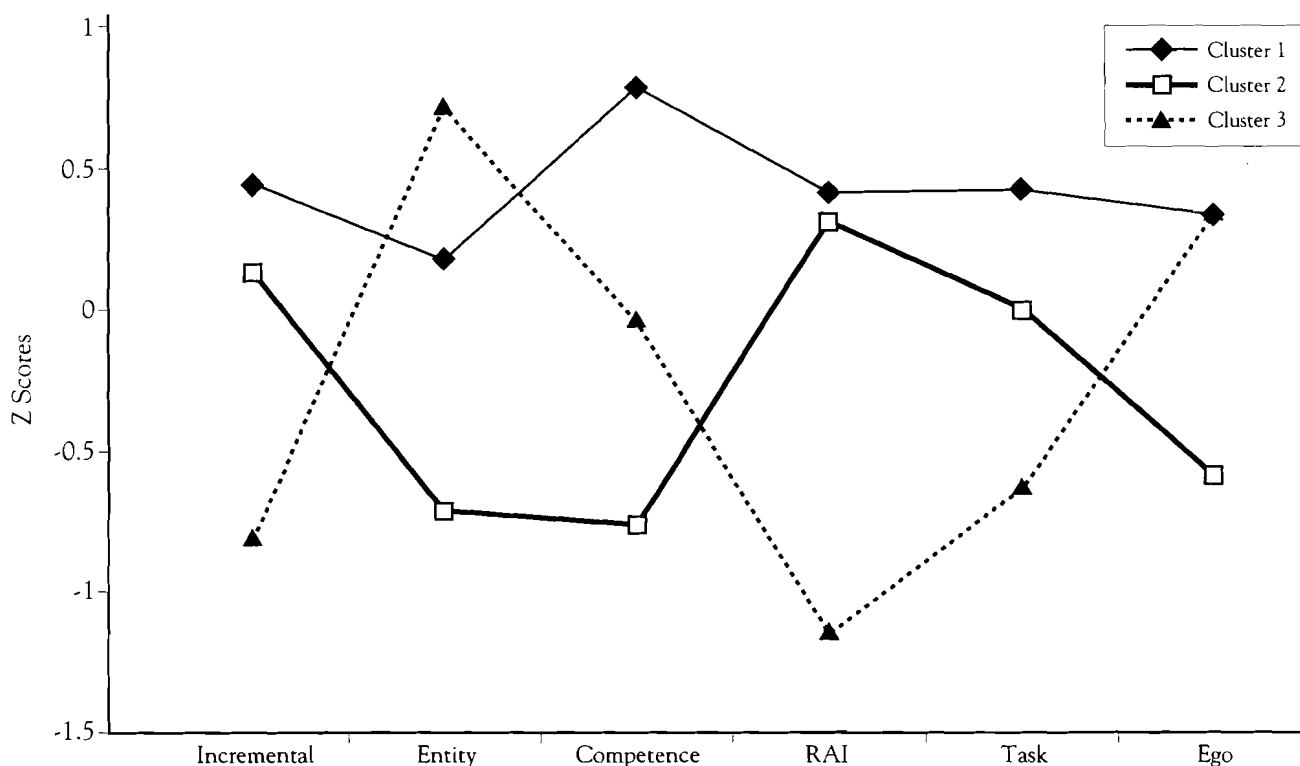

Fig 2. Profiles of beliefs about the purposes of PE among the three clusters.

* Note. Cluster 1 = High Incremental/High Competent, Cluster 2 = Low Entity/High Autonomy, Cluster 3 = High Entity/Low Autonomy.

Discussion

The purpose of the current study was to examine the beliefs about sport ability, achievement goals, motivational regulation, and perceived purposes of PE for a group of Singaporean preservice PE trainees. Overall, the preservice PE trainees had high task orientation, incremental beliefs, and high intrinsic motivation towards sport participation. They generally believe that the purposes of PE were to enhance health and fitness of the students, to develop good citizens, to teach students to strive for excellence and should contribute to the overall development of the child. This is an encouraging finding as these qualities are seen as desirable to be effective PE teachers (McCullick, 2001). PE teachers are role model and can make a difference in the lives of their students, thus, it is important for them to have the correct values and beliefs in education, even before they are trained.

Consistent with previous studies, the relationships between sport ability beliefs and goal orientations were supported. That is, entity beliefs are positively related to ego goal orientation and incremental beliefs associated with task orientation. Dweck and her colleagues (e.g., Chiu et al., 1997; Dweck et al.; 1995; Hong et al., 1999) showed that children believing that intelligence is changeable (an 'incremental theory' of intelligence) were more likely to adopt a task goal and show positive motivation whereas children believing in a more fixed notion of intelligence (an 'entity theory' of intelligence) were more likely to adopt an ego-oriented achievement goal and showed less adaptive responses to failure. Studies in the sport and exercise domains have arrived at the similar findings (Biddle et al., 1999; Sarrazin et al., 1996; Wang & Biddle, 2001). Most previous studies were conducted with children. The finding of the present study provides support that sport ability beliefs determine goal orientation in adults in the same way as children. That is, incremental beliefs are linked to task orientation and entity beliefs are related to ego orientation.

The overall means, however, hide important differences between distinct groups at an intraindividual level. The use of cluster analysis allows researchers to examine differences in these key psychological variables at a within-person level. The results of the cluster analysis revealed three distinct clusters of preservice PE trainees. The 'High Incremental/High Competent' cluster (Cluster 1) consisted of a large proportion of the preservice PE trainees (37.1%) with high incremental beliefs, high perceived competence and high perceived autonomy. Their perceptions of the purposes of PE were associated with health and fitness promotion, excellent striving, citizenship development and overall development of the child, compared to the other two clusters. The profile of this cluster is very similar to the 'Highly Motivated' cluster found in Wang and Biddle's (2001) study. Their study found that a very large percentage (83.8%) were athletes who reported significantly higher physical activity and physical self-worth compared to

students in the other four clusters. Overall, the present study confirmed the adaptive motivational outcomes of incremental beliefs, task orientation, and autonomy regulation.

The 'High Entity/Low Autonomy' cluster reflected a profile with low incremental beliefs, high entity beliefs and low autonomy, although the perceived competence was average, this group of participants did not strongly believe that the purposes of PE were associated with health and fitness, striving for excellence, being a good citizen and contribute to the overall development of the child. In previous studies (e.g., Wang and Biddle, 2001; in press), this cluster was had a similar profile of the 'Amotivated' cluster, which exhibited maladaptive behaviours such as lowest physical activity and lowest physical self-worth. In another earlier study (Weiss, Ebbeck, & Horn, 1997) also found a cluster of motivationally 'at risk' children were those with low physical self-perceptions. One concern here is that how would these group of preservice PE trainees with such negative profile delivery quality PE programme to enhance their pupils' motivation toward physical activity? Ennis (1996) suggest that PE teachers' beliefs and perceptions of PE may affect the implementation of a curriculum and student learning. Therefore, there is a need for teacher educators to identify this group of preservice PE trainees and influence them to the correct values and beliefs related to PE.

Practical Implications

These results have potential implications for the teacher educators in the PETE. Firstly, preservice PE trainees are normally being recruited into the PETE purely based on the sporting background and academic qualifications. As such, their beliefs of the purposes of PE are rarely taken into consideration. Inevitably, the cohort will consist of trainees with mixed beliefs and values in PE. One important implication for teacher educators is to understand the different profiles or biographies of the trainees and identify those with undesirable values orientations and beliefs.

Secondly, there is also a need to inculcate or reinforce the desired values and purposes of PE among the PE trainees in the PETE. For example, teacher educators may influence PE trainees' perceptions and beliefs about the importance of PE through promoting autonomy, mastery climate and emphasize the importance of learning and incremental aspects in the acquisition of sport and other physical activity skills in their delivery. PE trainees may learn specific instructional practices and strategies to provide a classroom structure conducive to motivational outcomes. In addition, teacher educators can also challenge PE trainees' beliefs in their delivery of modules. Gabriele (1996) suggests that beliefs held by teacher trainees can be successfully challenged by selectively targeting beliefs within particular courses.

Thirdly, PE in schools has the potential to promote good

citizenship, character building and moral developments (Shields & Bredemier, 1995). It is important that the course content of the PETE programme to reflect upon these potentials and equip teachers with the skills and knowledge for teaching students in schools. Teacher educators need to define character development in sport and physical activity settings. In their delivery, teacher educators should provide the knowledge of character development in sport and outline practical strategies for character development in PE.

The findings from the present study support the importance of examining the perceptions and beliefs of preservice PE trainees in teaching PE. At present, we know relatively little about the biographies of our preservice PE trainees. There is a need for continued effort in this line of inquiry. There are a few limitations in this study which need to be addressed in future research. Firstly, this study used a two-dimensional dispositional goal orientation and excluded the approach-avoidance dimension (Elliot, 1997; Elliot & Harackiewicz, 1996). Future studies need to include the approach-avoidance dimension to gain a clearer perspective of the motivational profiles. Secondly, the design of the study was cross-sectional and the variables were measured at one time point. We have no knowledge of whether these variables change over time. Future studies need to track the changes in these variables using longitudinal studies. Thirdly, this study did not examine the effect of PETE on changing the perceptions and beliefs of PE trainees. Future research can use a pre-post design to examine differences among preservice PE trainees' beliefs and perceptions of PE at entry point and exit point. Finally, we do not know the relationship between these perceptions and practice. There is a need to test the causality of beliefs on behaviour in PE teaching.

To conclude, the results in the present study showed that preservice PE teachers' belief about sport ability and perceived autonomy help build a meaningful framework to understand their beliefs about the purposes of PE. As teacher educators, we need to understand the profiles of our preservice trainees as they enter the PETE. Throughout the entire programme, there is a need for more intentional about planning learning experiences to help our preservice trainees develop their beliefs about the importance of PE and influence them to become physical education advocates.

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