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The association of a supportive physical education climate and leisure time physical activity involvement levels in a Singapore junior college

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Abstract

With the rise of weight related illness worldwide, it is important that youth be instilled with lifelong physical activity habits in school. Physical education teachers play an important role in creating motivationally supportive environments during physical education so as to equip youth with the necessary skills, knowledge, and competence to chose and participate in health-related physical activity in their leisure time. Students in a junior college in Singapore completed measures of perceived autonomy support, perceived competence, usefulness and interest in physical education and leisure time physical activity levels. Results revealed a correlation between leisure time physical activity and perceived autonomy support, perceived competence and usefulness of physical education.

Introduction

The rise of overweight and obesity problems have been on the increase globally. The World Health Organisation reported that in 2005, approximately 1.6 billion people age 15 plus and above were overweight and at least 400 million adults were obese. This figure has been projected to approximately 2.3 billion adults being overweight in 2015 and more than 700 million obese. (World Health Organisation, 2006)

We in Singapore are also not spared with obesity figures rising from 6.0% in 1998 to 6.9% in 2004. (Health Promotion Board, 2004a)

Extensive research has been done to show how childhood overweight is related to sleep apnea (Alexandros et al, 2000), asthma (King, Mannino, & Holguin, 2004), orthopedic problems (Kaur, Hyder, & Poston, 2003), depression (Wardle & Cooke, 2005), low self-esteem (French, Story & Perry ,1995), stigmatization and social isolation (Goldfield, Kalakanis, Ernst & Epstein , 2000), anxiety (Anderson, Cohen , Naumova & Must, 2006), and eating disorders (Levine , Ringham, Kalarchian , Wisniewski & Marcus, 2006).

Apart from increasing physical activity as one of the factors to combat obesity, physical activity has also been associated with a healthier self-image , lower stress levels (Harrison & Narayan, 2003), improved self esteem (Ransdell , Dratt , Kennedy , O'Neill & DeVoe, 2001) and maintenance of overall physical health (World Health Organisation, 2010).

Physical activity then has several physiological and psychological benefits for youth and children. Given the benefits of physical activity, there is an imperative need for understanding of the decline of physical activity habits as one age. (Van Wersch, Trew, & Turner, 1992; Papaioannou, 1997). Therefore, it is important to examine students' motivation for participation in physical education classes.

There have been several studies that hypothesized that the determinants of physical activity participation are physiological, social, ecological and psychological. (Dishman, Sallis & Orenstein, 1985 ; Sallis et al, 1992 ; Lovasi, Hutson, Guerra & Neckerman, 2009)

Physiological determinants include maturation, growth and aerobic fitness (Goran, 1999;Goran, Richard & Barbara, 2001) These factors in some sense are beyond the controlled class environment. Psychological determinants of physical activity, on the hand, which includes motivation , enjoyment, self-efficacy for physical activity, perceived benefits of physical activity, health beliefs, perception of one's fitness level, and sense of personal control (Chyun et al, 2009 ; Sharma et al, 2009, Debate, 2009) can be influenced by the teacher.

Educating on the ills and prevention of overweight issues is crucial in the battle of obesity and schools serve as a prime platform to instill good health habits. Physical education (PE) can be an appropriate context in which to encourage young people to engage in exercise or sport in and out of school and promote leisure time and lifelong physical activity.

PE also provides opportunities for enjoyment, for learning new motor skills and for co- operating with others. Knowledge regarding a healthy life style can also

be transmitted during PE.

In the opinion of Epstein (1998, 1999), the teacher plays an active role in the creation of the perception of the motivational climate and, therefore, in the quality of the motivation. It is crucial that the PE teacher creates a supportive environment for the propagation of physical activity habits among students so as to empower them to be self determined after they graduate from school.

It is not uncommon then that the role of motivation is critical in the achievement of student learning (Chen, 2001; Nicholls, 1989, Ryan and Deci 2000). Motivation has been coined as an observable process of student learning. Students are more likely to engage in physical activity when activities and games interest them.

The self determination theory (Ryan and Deci, 2000) proposes that human beings possess three basic psychological needs, autonomy, competency and relatedness. Autonomy is the perception that a person's behaviour is freely chosen. Competence is having a sense of mastery at a task. Relatedness is described as the satisfaction and involvement that one has with others. When all three needs are met, it will lead to one being intrinsically motivated and learning will occur.

A number of studies have shown that perceived competence is positively associated with intrinsic motivation, that is, if students feel that they are competent in a P.E. class, they enjoy their participation (Goudas, Biddle, & Fox, 1994; Goudas, Dermitzaki, & Bagiatis, 2000; Whitehead & Corbin, 1991)

Intrinsic motivation is also influenced by an autonomous supportive environment. Students who feel autonomous for their actions are more intrinsically motivated (Goudas et. al., 1994).

Students' expectancies about P.E. are also associated with their intrinsic motivation. Goudas, Dermitzaki and Bagiatis (2000) reported that when students perceive that what they do and encounter in their PE lesson as useful and

important outcomes, then intrinsic motivation is expected to occur.

In addition, being in an autonomous supportive environment increases intrinsically motivated behaviors which enhances psychological well being, self esteem, interest, enjoyment, fun, and persistence (Ryan & Deci, 2000).

Affective engagement refers to the emotional reactions and feelings experienced by students in the classroom such as interest, boredom, happiness, sadness and anxiety (Connell & Wellborn, 1991; Skinner & Belmont, 1993). Students manifesting such emotions can be influenced by the PE learning climate.

Considering the influence of the constructs of the self determination theory on PE participation, Hagger, Chatzisarantis, Culverhouse and Biddle (2003) proposed a trans-contextual model hypothesizing that young people's perceived autonomy support in PE will affect their perceived locus of causality, intentions, and physical activity behavior in leisure time. The study was carried out on 295 high school students in Britain. Results supported the trans-contextual model that autonomy support in an educational context influences motivation in a leisure-time context.

The goal of this study is then to examine the relationship between perceived usefulness of PE and leisure time physical activity (H_1), perceived interest of PE and leisure time physical activity (H_2), perceived competence of PE and leisure time physical activity (H_3), perceived autonomy support of PE and leisure time physical activity (H_4) of youths in a junior college in Singapore.

Methods

Subjects

Subjects were 103 students (male = 46, mean age = 17.28 and female = 57, mean age = 16.86) from a junior college. The school principal granted initial consent for data to be collected in the school. The students were convenience

sampled from existing intact classes. A letter of consent and explanation of the study was presented to the subjects before the questionnaires were distributed. The questionnaire was completed in 15 minutes.

Measures

Perception of PE climate

Students' perception of the usefulness of PE, interest of PE, perceived competence and perceived autonomy support were assessed using subscales from different validated inventories.

Perceived usefulness of PE

The Usefulness subscale of the Intrinsic Motivation Inventory (IMI) (McAuley, Duncan & Tammen, 1989) was used to assess the usefulness of PE (6 items) (eg "I think PE is important because it can help me to learn how to exercise on my own"). Items had been changed and adapted to the local context and culture. All items were measured on a five point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Perceived interest of PE

The Interest, subscale of the Intrinsic Motivation Inventory (IMI) (McAuley, Duncan & Tammen, 1989) was used to access interest of PE (6 items) (eg "I feel that my PE teacher makes PE fun').Items had been changed and adapted to the local context and culture. All items were measured on a five point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Perceived competence of PE

The perceived competence subscale of the Intrinsic Motivation Inventory (IMI) (McAuley, Duncan & Tammen, 1989) was used to access competence of PE (6

items) (eg “After working at new skills and activities during PE for awhile, I felt pretty competent”). Items had been changed and adapted to the local context and culture. All items were measured on a five point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Perceived autonomy support

An adapted version of the Learning Climate Questionnaire (Williams & Deci (1996) (6 items) (eg “I feel understood by my PE teacher”) was used to access the perceived autonomy supportive climate of the PE lesson. Items had been changed and adapted to the local context and culture. All items were measured on a five point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Leisure time physical activity levels

Students’ level of physical activity was measured using the Physical Activity subscale of the Physical Self-Description Questionnaire (PSDQ) (Marsh, Richards, Johnson, Roche, & Tremayne (1994). It consists of 6 items (eg “I get exercise or activity three or four times a week that makes me breathe much harder than normal (huff and puff) and lasts at least 20 minutes”) measured on a five point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Data analysis

Descriptive statistics was used to ascertain normal distributions of the variables. A reliability analysis was done to confirm reliability index of the scales. Regression analysis was also conducted to determine the path analysis of the perceived usefulness of PE, perceived interest of PE, perceived competence of PE and perceived autonomy support to leisure time physical activity. In addition, independent *t* tests were done to determine gender differences among the variables. All analyses were done using SPSS v 17.

Results

Table 1 provides the descriptive results of the six quantitative measures. Means ranged from 17.05 (SD = 2.22) for age to 3.11 (SD = 0.96) for physical activity levels.

Table 1: Descriptive statistics

	Male (n = 46)				Female (n = 57)			
	Mean	SD	Skew	Kurtosis	Mean	SD	Skew	Kurtosis
Age	17.28	0.91	1.24	2.150	16.86	2.86	- 4.64	22.22
Perceived Usefulness	3.87	0.58	- 0.18	0.96	3.51	0.62	0.31	- 0.05
Perceived Interest	3.65	0.56	0.50	- 0.10	3.44	0.58	0.42	0.69
Perceived Competence	3.54	0.89	- 0.48	0.13	3.04	0.72	- 0.06	- 0.65
Autonomy support	3.39	0.63	0.42	- 0.60	3.13	0.60	0.27	0.64
Leisure time physical activity	3.46	0.86	- 0.31	- 0.72	2.82	0.94	0.21	- 0.43

	All (n =103)			
	Mean	SD	Skew	Kurtosis
Age	17.05	2.22	- 5.58	35.96
Perceived Usefulness	3.67	0.63	0.05	- 0.03
Perceived Interest	3.54	0.58	0.41	0.29
Perceived Competence	3.26	0.83	- 0.10	- 0.38
Autonomy support	3.25	0.62	0.36	0.06
Leisure time physical activity	3.11	0.96	- 0.06	- 0.74

To ascertain reliability of the scales, Cronbach's alpha was calculated for perceived usefulness, perceived interest, perceived competence, autonomy support and leisure time physical activity levels. All of the subscales had acceptable alpha levels based upon by Henderson's (1993), Topp and Stevenson's, (1994) and Nunnally's (1978) criteria of 0.70. (perceived usefulness = 0.74, perceived interest = 0.87, perceived competence = 0.90, autonomy support = 0.86 and physical activity level = 0.89). Correlation coefficients pointed out significant positive correlations between leisure time physical activity and

usefulness ($r = 0.265$, $p < 0.05$), leisure time physical activity and perceived competence ($r = 0.642$, $p < 0.05$) and leisure time physical activity and autonomy support ($r = 0.457$, $p < 0.05$). However, there was no significant relationship between interest and leisure time physical activity ($r = 0.129$, $p > 0.05$). Table 2 shows the correlations between the variables and the reliability indexes.

Table 2: Correlation and reliability indexes

	Mean	SD	Cronbach Alpha	Perceived Usefulness	Perceived Interest	Perceived Competence	Autonomy support	Leisure time Physical activity
Perceived Usefulness	3.67	0.63	0.87	1				
Perceived Interest	3.54	0.58	0.74	0.698**	1			
Perceived Competence	3.26	0.83	0.90	0.522**	0.516**	1		
Autonomy support	3.25	0.62	0.86	0.607**	0.673**	0.587**	1	
Leisure time Physical activity	3.11	0.96	0.89	0.265**	0.129	0.642**	0.457**	1

Note: ** $p < 0.05$

To investigate whether males differ from females on age, perceived usefulness, perceived interest, perceived competence, perceived autonomy support and leisure time physical activity levels, six *t*-tests were conducted using gender as independent variable and age, perceived usefulness, perceived interest, perceived competence, autonomy support and leisure time physical activity as dependent variables.

To reduce the likelihood of committing Type I error, the alpha level was reduced from 0.05 to 0.008. Results showed that males did not differ from females on age ($t = 0.96$, $p > 0.008$, effect size = 0.095), Interest ($t = 1.87$, $p > 0.008$, effect size = 0.18) and perceived autonomy support ($t=2.16$, $p>0.008$, effect size=0.21).

However, males and females differ on perceptions of usefulness of PE ($t = 2.95$, $p < 0.008$, effect size = 0.28), perceived competence of PE ($t = 3.14$, $p < 0.008$, effect size = 0.30) and levels of leisure time physical activity participation ($t = 3.59$, $p < 0.008$, effect size = 0.34).

Effects of variables on leisure time physical activity levels

In order to answer the relationship between usefulness, interest, competence, autonomy support and physical activity levels, the following model was proposed:

$$Y \text{ (physical activity levels)} = a + b_1(\text{usefulness}) + b_2(\text{interest}) + b_3(\text{competence}) + b_4(\text{autonomy})$$

Results, as shown in Table 3, indicated that the 4 predictor variables combine to account for 53.9% of the variance in leisure time physical activity levels. There were three statistically significant contributions to the prediction of greater leisure time physical activity. Specifically, there was a statistically significant effect with regard to perceived competence ($b = 0.748$, $p = < 0.0005$) and autonomy support ($b = 0.59$, $p = < 0.0005$). However, the regression coefficient for perceived usefulness ($b = 0.051$, $p = 0.742$) was not significant. Although perceived interest is significant ($b = -0.841$, $p = < 0.0005$), the regression coefficient is negative, which appears that being uninterested in PE will result in greater leisure time physical activity. This however should be noted that from the correlation analysis, there was no relationship between perceived interest of PE and leisure time physical activity levels.

These results show that physical activity levels were predicted by a combination of 3 predictor variables. With respect on the influence each specific predictor had on the criterion, the amount of perceived usefulness of PE did not appear to be meaningfully predicting leisure time physical activity levels.

Table 3: Regression model predicting level of physical activity as a function of PE climate variables

Variable	Coefficient B	SE	Beta	<i>t</i>	<i>p</i>	<i>R</i> ²
(Constant)	1.441	0.44		3.30	0.001	0.539
Usefulness	0.051	0.15	0.033	0.33	0.74	
Interest	- 0.81	0.19	- 0.49	- 4.58	< 0.0005	
Competence	0.75	0.10	0.65	7.41	< 0.0005	
Autonomy support	0.59	0.16	0.38	3.78	< 0.0005	

This study supported the hypothesis that perceived usefulness of PE predicted leisure time physical activity (H₁). On the hypothesized relationships between perceived interest of PE lessons and leisure time physical activity, no significant relationship was observed. So H₂ was not supported. In accordance with the third hypothesis of the present study (H₃), perceived competence of PE predicted leisure time physical activity. With respect to the perceived autonomy support of PE, there was an influence on leisure time physical activity. This supported the fourth hypothesis (H₄).

Discussion

The objective of this study is to investigate if autonomous forms of motivation (autonomy support) and motivational orientations (perceived usefulness, perceived competence and interest) during PE can be associated with leisure time physical activity.

Results in this study indicated a strong correlation between students' perception of an autonomy supportive environment and leisure time physical activity.

This is in line with studies in self determination theory which have shown a correlation between persistent behaviour and autonomous forms of motivation (Chatzisarantis & Biddle, 1998; Williams, 2002; Williams et al, 2002)

It was also evident that social contexts that support autonomous motivation (eg, behaviour of PE teachers) promote autonomous motivation and behavioural persistence in education (Black & Deci, 2000; Reeve, 2002; Vansteenkiste, et al; 2004) and other life contexts (Gagne, 2003; Willams et al, 1998)

In the present study, perceptions of competence were found to be more predictive of leisure time physical activity than perceived autonomy support.

Previous PE research (Ferrer-Caja & Weiss, 2000; Goudas & Biddle, 1994; Ntoumanis, 2001) had revealed that perceived competence emerged as a crucial

construct in predicting self determined motivation in PE.

A study by Ntoumanis (2001), realised a negative path coefficient emerged between competence and amotivation. In addition, nonsignificant paths between autonomy and amotivation and relatedness and amotivation were observed which supported the self determination theory of perceptions of competence playing a pivotal role in predicting positive and negative engagement in PE.

Thus, in PE situations in which students have little, if any, sporting experience (Papaioannou, 1994), the performing of sport tasks in conditions that require them to demonstrate the skill may make it difficult for students who doubt their competence to maintain active, unselfconscious involvement during the PE lesson and thereby translating the skill in leisure time physical activity (Nicholls, 1989).

In the model as proposed in this study, there is no significant relationship between perceived interest of PE and leisure time physical activity ($r = 0.129, p > 0.05$). The self determination continuum (Ryan & Deci, 2000) proposed that extrinsic motivation can, however, be relatively autonomous. In a state of identified regulation, one can be engaged in the extrinsic action because he or she identifies with its purpose or value. In this context, students may exercise in their leisure because they believe that exercise enhances their health and well being although PE lessons may be uninteresting to them.

For the PE curriculum in schools in Singapore, the skills, games and activities designed during PE follow an assigned syllabus. That said, the PE lesson could have covered a particular game or sport that is of no relation to the game or sport that the student usually engages and therefore poses no particular interest to the student. This finding should be of importance to the PE teacher to design lessons that are relevant to mimic leisure time physical activity. That said, the relationship between interest of PE lessons and leisure time physical activity should be reexamined in future studies.

Gender differences

This study revealed that males engaged in more leisure time physical activity than females ($t = 3.591$, $p < 0.008$, effect size = 0.34).

Several studies from both developed and developing countries have ascertained that males were more active than females in leisure-time physical activity (Burton & Turrell 2000; Martinez-Gonzalez et al. 2001; Steptoe et al. 2002). Two studies, presented at a major academic conference at the University of Exeter, reveal that males were more physically active than females among school children and adults over 70 years old (University of Exeter, 2009). A nation wide census in Singapore also revealed that males participated more in leisure time physical activity and females were more physically inactive than males (Health Promotion Board, 2004b).

Findings from this study showed that males perceived themselves to be more competent in PE than females ($t = 3.144$, $p < 0.008$, effect size = 0.30).

Studies have consistently reported that boys have higher perceptions of their overall physical competence and are more positive than girls about their ability in most traditional sport activities (Eccles *et al.*, 1989; Harter, 1982; Marsh *et al.*, 1984).

In addition, males in this study perceived PE to be more useful than females ($t = 2.95$, $p < 0.008$, effect size = 0.28).

An evident reason may be its usefulness in helping males prepare themselves physically for national service in the Army. In Singapore, the national physical fitness test (NAPFA) is primarily carried out in schools, tertiary institutions and the army. Males will continue to be assessed during their national service stint and after their 2 year stint in the army when they report for their annual Individual Physical Proficiency Test (IPPT). Females on the other hand, will only be assessed up to their secondary or tertiary education and thus may not find PE

relevant in helping them prepare for fitness tests Chia, Quek & Wang, 2009).

Limitations of study

This study represents students' views from a high achieving junior college. The majority of these students have excelled in their academic studies and in sports. Thus the conclusions are mostly applicable to those students.

Subjects were also convenience sampled from an existing intact class. This subjects the participants to selection threats and limits the generalizability of the study.

There are also problems associated with assessment of physical activity. Problems involving use of self report questionnaires and physical activity diaries include recall bias (Ainsworth et al, 1998; Sallis and Salens, 2000), differential interpretations of terms (eg, light, moderate, vigorous activity) (Wilcox et al, 2001), floor effects (Tudor-Locke and Myers, 2001a) and a lack of sensitivity to daily activity like walking (Richardson et al, 1994). These factors could affect the results of physical activity level reports in this study.

While there appears to be a relationship among the variables of this study, evidence from the data are correlational and do not warrant causal effects.

Implications for practice

Practical recommendations arising from this study suggest that PE teachers can have a pervasive influence on leisure time physical activity of their students.

PE teachers need to model autonomy supportive behaviours like listening to students, offering encouragement and involving them in decision making process. In addition, varying lesson plans like changing warm up drills and modifying skills related test (eg basketball shooting) can improve the fulfillment of competence needs.

Data in this study also supports the continuance of efforts of PE teachers to be aware of the importance of fostering competence among children of all abilities in order to equip them to engage in sports (eg soccer) during leisure time.

Research has documented that sex linked movement tasks can mediate gender differences in ability perceptions, with males displaying more confidence in masculine-typed tasks and females displaying more confidence on feminine-typed tasks (Clifton & Gill, 1994; Lirgg, 1991; Sanguinetti *et al.*, 1985). Masculine-typed tasks are generally those requiring strength, power, and competitiveness. Typical feminine-typed tasks, however, are associated with the attributes of graceful movement qualities (eg dance). With this in mind, PE teachers can try to design activities with regard to the gender preferences of their class.

Providing a rationale for activities in PE (eg focusing on a drill but explaining the reason behind the drill) have shown to enhance autonomous motivation (Deci et al, 1994).

PE teachers can help students in setting realistic and relevant goals for them to engage in leisure time physical activity (eg improving on the basic skipping skills taught during PE)

Future directions

Leveraging on the predictive study on autonomous motivations and leisure time physical activity, future studies can explore the causal effects of actual autonomy support on leisure time physical activity. Experimental studies can also focus on the interactive models of other theories and its effects on physical activity (Koestner et al, 2002, Prestwich et al, 2003). Researchers in physical education and physical activity can also explore different research tools and measurement instruments (eg pedometers).

Eliciting the different motivations (eg using the Behaviour Regulation for Exercise

Questionnaire) as mentioned in the self determination continuum can also shed light on the habits of leisure time physical activity.

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