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# Students' motivational responses toward school physical education and their relationship to general self-esteem and health-related quality of life

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## Abstract

**Objectives:** In addition to encouraging a physically active lifestyle, the aims of school physical education (PE) also encompass the promotion and development of self-esteem and perceptions of health. Using self-determination theory [SDT; Deci, E.L., & Ryan, R.M. (1991). A motivational approach to self: Integration in personality. In: R.A. Dienstbier (Ed.), *Nebraska symposium on motivation: Perspectives on motivation* (Vol. 38, pp. 237–288). Lincoln, NE: University of Nebraska] as a conceptual framework, we examined three competing models specifying relations among motivational processes toward PE, students' general self-esteem, and health-related quality of life (HRQoL).

**Design:** A field correlational prospective design.

**Method:** Three hundred British secondary school students ( $M$  age = 13.51 years;  $SD$  = .76) responded to a multi-section inventory assessing their motivational processes toward school PE. One week later, data pertaining to general self-esteem and HRQoL were obtained.

**Results:** Following minor modifications, structural equation analysis showed the three competing models to provide excellent fit to the study data. All models showed (i) perceptions of autonomy support provided by the PE teacher to positively predict autonomy, competence, and relatedness, (ii) competence and autonomy to positively predict autonomous motivation toward PE, and (iii) direct paths from competence to general self-esteem and from relatedness to HRQoL. Model 1 showed autonomous motivation to positively predict general self-esteem, which in turn positively predicted HRQoL. Model 2 supported a positive path from autonomous motivation to HRQoL, with HRQoL positively predicting general

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self-esteem. Model 3 supported general self-esteem and HRQoL to be distinct, yet related, dependent variables that were positively predicted by autonomous motivation toward PE.

*Conclusion:* These findings call for future work to examine the causal associations among motivational processes, self-esteem, and HRQoL. The theoretical contributions of SDT to such work are discussed.

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## Introduction

School is a context that can have considerable influence on the mental health and quality of life of children and adolescents. One overarching aim of the school system is to “promote pupils’ self-esteem and emotional well-being and help them to form and maintain worthwhile and satisfying relationships, based on respect for themselves and for others, at home, school, work and in the community” (Department for Education and Employment and the Qualifications and Curriculum Authority 1999, p. 11). Such an objective encompasses two important indexes of mental health, namely *self-esteem* (i.e., “the awareness of good possessed by self” Campbell, 1984, p. 9) and *quality of life (QoL)* (i.e., a students’ overarching subjective evaluation of how life is going for them in relation to their values and expectations).

A subject that is included in the National Curricula of most countries and one extolled to promote self-esteem is physical education (PE) (cf. Whitehead & Corbin, 1997). Similar to the elements of exercise programs that are associated with a change in self-esteem (cf. Sonstroem, 1984), PE classes can, among other benefits, provide opportunities for children and adolescents to experience physical fitness gains, encounter feelings of somatic well-being, enhance their competencies, foster social interaction with classmates, and obtain reinforcement from others. Despite such apparent benefits and the advocating of PE as being a vehicle to enhance perceptions of the self, the extant literature has been fraught with definitional inconsistencies, scarce empirical testing, and a lack of theoretical application (Whitehead & Corbin, 1997).

In addition to the scarcity of work pertaining to self-esteem within the PE-context, past work has failed to explore the relationship between PE-related variables and QoL. It is understandable that past research has not empirically tested a direct relationship between participation and/or motivation in PE and “how good one perceives their life to be” (i.e., overall QoL) as this relationship would exceed the scope of school PE. However, given that PE has been advanced as a context to contribute to public-health promotion (cf. Fox & Harris, 2003) it is surprising that past work has overlooked potential links between PE-related variables and students’ health-related quality of life (HRQoL). HRQoL is a multi-dimensional construct subsumed within QoL consisting of the components (in the present work *physical, emotional, social, and school*) that relate directly to health, that impact on health, or can be affected by health interventions. As such, HRQoL represents the aspect of overall QoL that is most pertinent to the field of physical activity (including the PE context).

Increments in pupils’ self-esteem and HRQoL are likely to be influenced, in part, by factors such as perceptions of the teaching environment and their motivation. With the latter in mind, the quality of an individual’s motivation has been previously singled out as having important implications for one’s self-esteem (Deci & Ryan, 1995; Fox, 1997, 2002). A motivational framework that makes hypotheses with regard to how different forms of motivation influence

one's self-esteem and other indices of mental health/well-being is self-determination theory (SDT; Deci & Ryan, 1991, 2000). As SDT affords the opportunity to examine the relationship between different types of motivation and perceptions of the self (Fox, 2002), akin to recent work in PE (e.g., Standage, Duda, & Ntoumanis, 2003, 2005; Ntoumanis, 2005) the theoretical tenets of SDT were used to formulate our hypotheses.

### **Motivation, self-esteem, and HRQoL**

According to SDT, autonomous motivation should lead to the development of global indices of well-being (e.g., self-esteem and HRQoL) because such regulation involves having a more integrated perception of the self (Deci & Ryan, 1995).<sup>1</sup> Regarding self-esteem, SDT holds that autonomous motivation promotes an individuals' true self-esteem (i.e., a stable and secure sense of self; see Deci & Ryan, 1995). As Deci and Ryan (1995) state "...one experiences true self-esteem, and this type of self-esteem will be enhanced only when one's actions are self-determined—that is only when one acts with an internal perceived locus of causality" (p. 46). In the school PE context, Hein and Hagger (2007) have found pupils' autonomous motivation towards PE to have a positive direct effect on reported global self-esteem. In a similar vein, recent work with school children has also corroborated the benefits of autonomous motivation by revealing a positive association between self-determined motivation towards exercise and reported quality of life (Gillison, Standage, & Skevington, 2006). In the present work, we hypothesized that autonomous motivation towards PE would positively predict the students' level of general self-esteem and/or HRQoL (see Fig. 1 for hypotheses).

#### *Motivation towards PE and globally-assessed outcomes*

A conceptual model that provides valuable insight into how motivation towards PE may impact on indices of global well-being is the *hierarchical model of intrinsic and extrinsic motivation* (HMIEM) proposed by Vallerand (1997, 2001). Based on the notion that human motivation represents a complex structure that requires a more precise and refined investigation than being classed as a general and unitary construct, Vallerand (1997, 2001) proposed that motivation and its antecedents (social factors), mediators (basic needs), and consequences (affective, behavioural, and cognitive responses) operate at three levels of generality, namely situational (or state), contextual (or life domain), and global (or personality). The *situational level* refers to the motivation of an individual when they are currently engaged in a particular activity (i.e., the "here and now" level) (Vallerand, 1997). At the *contextual level*, motivation is depicted as an individual's "usual" motivation towards a particular context (e.g., sport, work, education) and is considered a relatively stable motivational disposition (Vallerand, 1997). Motivation at the *global level* is similar to an omnibus personality trait reflecting the manner in which an individual

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<sup>1</sup>According to SDT, several motivational regulations reside on a continuum that varies in the degree to which the regulations are autonomous. The regulations embraced by SDT are (from the most to the least self-determined) *intrinsic motivation*, *identified regulation*, *introjected regulation*, and *external regulation*. In the present work, we were interested in assessing autonomous motivation towards PE. For a discussion on the characteristics of each regulation addressed by SDT see Ryan and Deci (2002).

generally interacts with their environment, be that in an intrinsically, extrinsically, or amotivated fashion (Vallerand, 1997).

While a number of hypotheses pertaining to the interplay between motivation at the various levels of generality are advanced by the HMIEM, of particular relevance to the present work is the bottom-up relationship (or recursive pattern of association). This hypothesis holds that motivation experienced at a lower level of generality (e.g., contextual) may impact the next level up (e.g., global). The bottom-up proposition has received empirical support in the extant literature. For example, in a study exploring the hierarchical nature and stability of self-determined motivation, Guay, Mageau, and Vallerand (2003) found support for a reciprocal model in which contextual motivation towards school positively predicted global motivation overtime, both at 1 (study 2) and 5 (study 1) year follow-up. With the present work in mind, the HMIEM holds that repeated experiences of autonomous motivation toward school PE should have a recursive positive effect on global autonomous motivation and also nurture motivational outcomes assessed at the global level of generality such as self-esteem and HRQoL.

### *Self-esteem and HRQoL*

To date, the relationship between self-esteem and HRQoL has not received research attention in the context of school PE. However, based on empirical work in other life domains we sought to test, via competing models, three plausible interrelationships. Our attention now turns to delineating the theoretical underpinnings of each of these three hypothesized models (1–3). The proposed associations between general self-esteem and HRQoL in the specified models are shown in Fig. 1.

*Model 1.* Past research conducted with children and adolescent populations has shown general self-esteem to be an independent predictor of HRQoL (Marriage & Cummins, 2004; Yarcheski, Mahon, & Yarcheski, 2001).<sup>2</sup> Previous work has also shown perceptions of general self-esteem to positively predict variables aligned to those incorporated into measures of HRQoL (i.e., emotional, physical, school, and social domains). Indeed, empirical research has shown general self-esteem to positively predict a participant's happiness, life satisfaction, self-reported intelligence, school performance, positive relations with others, and perceptions of physical self-worth (e.g., Diener & Diener, 1995; Hansford & Hattie, 1982; Keefe & Berndt, 1996; Kowalski, Crocker, Kowalski, Chad, & Humbert, 2003; Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995). Model 1 is based on (i) the aforementioned empirical evidence and (ii) a literature search of electronic databases [via Web of Science, Medline (Pubmed), PsychInfo, and BIDS ISS] that revealed past work to infer that self-esteem is considered first and foremost a predictor of QoL as opposed to an outcome variable. With the latter in mind, an appealing aspect of Model 1 is that previous work has shown self-esteem to mediate the relationship between environmental factors (e.g., social support; Dantas, Motzer, & Ciol, 2002; Yarcheski et al., 2001) and reported QoL.

<sup>2</sup>Some measures of HRQoL include self-esteem as a domain within the generic measure (e.g., the Child Health Questionnaire (CHQ); Landgraf & Abetz, 1997; Quality of Life Profile—Adolescent Version (QOLPAV); Raphael, Rukholm, Brown, HillBailey, & Donato, 1996); however, it is not included within the Pediatric Quality of Life Questionnaire (PedsQL 4; Varni et al., 1999).

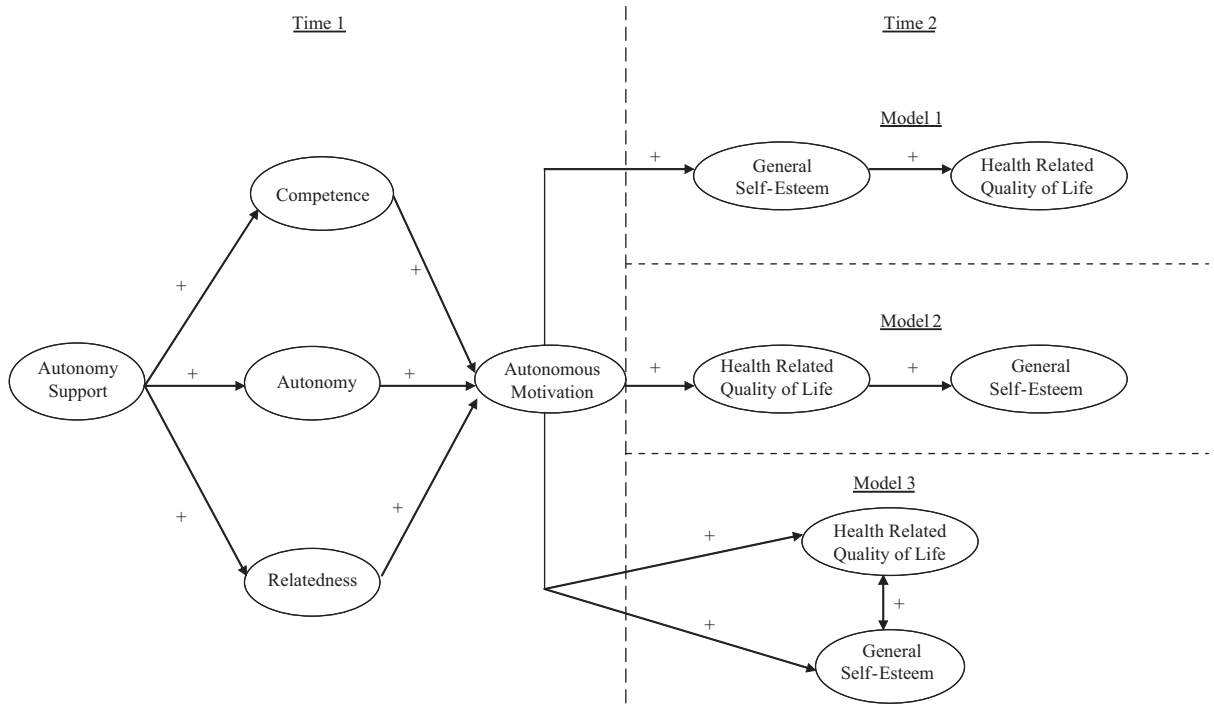


Fig. 1. Hypothesized model's of motivational processes.

*Model 2.* Although no work to date has examined the predictive utility of HRQoL on self-esteem, model 2 explores an alternative explanation that general self-esteem is an outcome variable of performing well in aspects of life encompassed by HRQoL (i.e., school, physical, emotional, and social). Drawing from past work, there are a number of empirically supported associations to justify the testing of this model. First, longitudinal work has shown school performance to lead to increases in self-esteem (e.g., Skaalvik & Hagtvet, 1990), suggesting self-esteem to be an outcome of school performance as opposed to a cause (see Baumeister, Campbell, Krueger, & Vohs, 2003 for a review). Second, and despite the potential for numerous non-physical attributes to contribute, perceptions of one's physical self-worth (underpinned by *sport competence*, *body attractiveness*, *physical condition*, and *physical strength*) has been consistently shown to be positively associated with general self-esteem (see Fox, 1997 for reviews of hierarchical models of the self-system). Third, emotional responses have been shown to positively predict general self-esteem in past work with children. For example, Ebbeck and Weiss (1998) found that positive affect experienced towards sport positively predicted reported levels of global self-esteem. Finally, Leary, Tambor, Terdal, and Downs's (1995) *sociometer* hypothesis holds that self-esteem is increased when individuals are successful, and decreases when people are unsuccessful, in their interpersonal relations. Although focussing only on relational bonds, from this perspective self-esteem is considered to be an outcome of interpersonal relations as opposed to a cause. To this end, Bishop and Inderbitzen (1995) found that children who had no friends at

all (i.e., nominated as being rejected by their peers) reported lower self-esteem than children who had at least one friend. These findings suggest that it may be a lack of friends that causes low self-esteem as opposed to low self-esteem resulting in poor relationships (cf. Baumeister et al., 2003).

*Model 3.* As self-esteem and HRQoL are both assessed at the global level and past work has shown the variables to be positively related (e.g., Varni, Seid, & Rode, 1999), we explored a model in which the disturbance terms of the two variables were covaried. This approach permitted us to assess whether a model specifying HRQoL and global self-esteem as distinct, yet related, dependent variables may be a more appropriate approach when data assessing HRQoL and self-esteem are collected at the same time-point (i.e., a cross-sectional research design).

### *Basic psychological needs*

At the core of SDT is the premise that the satisfaction of three innate psychological needs are essential nutrients for motivated behaviour, social functioning, and personal well-being (Ryan & Deci, 2002). These needs are for autonomy (the need to be agentic, give input, and self-endorse activities and beliefs), competence (the need to effectively interact with one's environment and yield wanted effects and outcomes), and relatedness (the need to feel connected, cared for, and close to significant others and one's community). In short, SDT holds that when these basic psychological needs are satisfied, autonomous motivation, psychological growth, and well-being are promoted (cf. Ryan & Deci, 2002). However, when these needs are not nurtured, autonomous motivation, well-being, and optimal functioning are diminished (Deci & Ryan, 2000). Past work in the context of school PE has shown the three needs to predict autonomous forms of motivation, both independently (Standage, Duda, & Ntoumanis, 2006) and when combined (Ntoumanis, 2005). Accordingly, in the present work we expected positive associations between autonomy, competence, and relatedness and autonomous motivation.

### *Social factors*

Aligned with SDT's proposition that active engagement and self-endorsed involvement in activities is linked to the fulfilment of basic needs, it is important to understand the social conditions that afford the satisfaction of autonomy, competence, and relatedness. A social environment identified by SDT to nurture students' need satisfaction, motivation, and well-being (cf. Reeve, Deci, & Ryan, 2004) and one that is pertinent to the current study is that of autonomy support provided by the teacher (i.e., social contexts that support choice, initiation, and understanding). Past work in the context of school PE has shown a positive association between autonomy support and each of the psychological needs (Standage et al., 2003, 2006). Based on this extant work, in the present study we expected that perceptions of autonomy support would be positively linked to autonomy, competence, and relatedness.

### *The present study*

This study sought to examine the relationships among students' motivational processes toward PE, their general self-esteem, and reported levels of HRQoL. Specifically, three models of

motivational processes were explored.<sup>3</sup> As shown in Fig. 1, at Time 1 the three models hypothesized that (a) perceptions of an autonomy-supportive PE environment would positively predict autonomy, competence, and relatedness ( $H_1$ ), (b) autonomy, competence, and relatedness would positively predict autonomous motivation towards PE ( $H_2$ ), and (c) autonomous motivation towards PE would positively predict variables assessed at the global level at Time 2 ( $H_3$ ). At Time 2, Model 1 hypothesized a positive path from self-esteem to HRQoL ( $H_4$ ), Model 2 hypothesized a positive path from HRQoL to self-esteem ( $H_5$ ), and Model 3 considered both HRQoL and self-esteem as dependent variables, by hypothesizing a covariance between the two global indices of well-being ( $H_6$ ).

## Method

### Participants

From an original sample of 371, complete data were collected at Times 1 and 2 from 138 male and 162 female ( $M$  age = 13.51 years;  $SD = .77$ ; range = 12–15 years) secondary school pupils from Years 8, 9, and 10 (ages 12–13, 13–14, 14–15 years, respectively). Data were obtained from three state schools located in the south of England. Consent to conduct the study was issued from a local research ethics committee and written consent was obtained from the Head Teachers of each school who were asked to act in loco parentis aligned with the ethical guidelines of the [British Psychological Society \(2000\)](#).

### Procedure

Data were collected using a two-wave prospective design. At Time 1 (T1), participants were requested to respond to a multi-section inventory assessing their motivational processes toward school PE (i.e., perceptions of autonomy support, autonomy, competence, relatedness, and PE motivation). One week later (T2), participants completed questionnaires to assess their general self-esteem and HRQoL. Aligned with past work (e.g., [Hagger, Chatzisarantis, & Harris, 2006](#)) this 1-week time delay was used so as to allay the possible confounding effects of common method variance. At both time-points, an investigator distributed the inventory and was on hand to help any participant who had questions pertaining to the wording and/or meaning of the questionnaire items. It was emphasized to the pupils that (a) there were no right or wrong responses to any of the items, (b) their PE teacher would not see their responses, (c) that they should respond honestly, (d) the data (i.e., completed questionnaires) would be treated in strictest confidence and remain locked in a filing cabinet at the university, and (e) the data would be reported in terms of group responses with no reference to any individual. Participants were offered the option to withdraw from the study at any time without any negative repercussions. No pupil refused to

<sup>3</sup>It should be noted that consistent with past empirical findings which have shown the basic needs to be associated with each other ([Reinboth, Duda, & Ntoumanis, 2004](#); [Sheldon & Bettencourt, 2002](#); [Standage et al., 2003](#)), the disturbance terms of the three needs were allowed to correlate. In the present work, the correlations of the disturbances were as follows:  $r_{\text{autonomy-competence}} = .27, .28, .27$ ;  $r_{\text{competence-relatedness}} = .31, .31, .31$ ;  $r_{\text{autonomy-relatedness}} = .25, .25, .25$ ; for Models 1, 2, and 3, respectively. All correlations were significant ( $p < .05$ ).

participate, nor did any participant withdraw from the study. On both occasions (T1 and T2) the questionnaire packs took approximately 20 minutes to complete, after which the pupils were thanked for their participation.

### *Measures*

*Autonomy support:* A modified version of the 6-item Learning Climate Questionnaire (LCQ; Williams & Deci, 1996) was used to assess the degree to which the pupils perceived the PE teacher to be autonomy-supportive. Specifically, we employed a measure previously used by Standage et al. (2005) in which the items are slightly amended to target the PE context. Example items include “we feel that the PE teacher provides us with choices and options” and “the PE teacher encourages us to ask questions.” Responses to the items were reported on a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Cronbach’s  $\alpha$  coefficients from past work with British secondary school children have revealed reliable scores to be provided to this scale (Standage et al., 2005, 2006).

*Autonomy:* Autonomy was measured using a 5-item scale (Standage et al., 2003, 2006). Preceded by the stem “In this PE class ...” participants responded to items (e.g., “I have some choice in what I want to do” and “I have a say regarding what skills I want to practice”). Responses were made on a 7-point Likert-type scale anchored by 1 (*strongly disagree*) to 7 (*strongly agree*). Support for reliability of scores provided with this scale has been supported in previous PE work with British children (Standage et al., 2003, 2006).

*Competence:* Competence was assessed using the 5-item perceived competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989). Items were reworded to target the PE context, for example “I am pretty skilled at PE.” Responses were indicated on a 7-point Likert-type scale anchored by 1 (*strongly disagree*) to 7 (*strongly agree*). Using Cronbach’s  $\alpha$  coefficients, similar aged participants in previous PE-based research involving British children has shown reliable scores to be provided to the competence subscale of the IMI (Standage et al., 2003, 2005).

*Relatedness:* Relatedness was assessed using the acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998). The stem was modified in the present study to be PE-specific (“With the other students in my PE class I feel ...”) and was followed by five items including “close”, “valued”, and “supported.” Responses were made on a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Reliable scores using this scale have been reported in previous PE work with British children (Standage et al., 2003, 2006).

*Autonomous motivation:* The pupils’ level of autonomous motivation toward PE was assessed using the Perceived Locus of Causality (PLOC) scale devised by Goudas, Biddle, and Fox (1994). Participants were asked to respond to the items using the stem “I take part in this PE class ...” Example items (four per subscale) are “because PE is fun” (intrinsic motivation), “because it is important for me to do well in PE” (identified regulation), “because I’ll feel bad about myself if I didn’t” (introjected regulation), and “because I’ll get into trouble if I don’t” (external regulation). Responses were made on a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Support for the reliability of scores (via Cronbach’s  $\alpha$  coefficients) and factorial structure (via confirmatory factor analysis; CFA) of this scale has emerged in previous work with British school children (Goudas et al., 1994; Ntoumanis, 2005).



For the purpose of examining the hypothesized structural equation models (SEM), consistent with past research (e.g., Vallerand, Fortier, & Guay, 1997) we assigned weights to the motivational items according to their respective location on the self-determination continuum. That is, a self-determined motivation index (SDI) reflecting “autonomous motivation” was calculated. As there are four items per subscale, four indexes are formed using the following formula;  $2 \times \text{intrinsic motivation} + \text{identified regulation} - \text{introjected regulation} - 2 \times \text{external regulation}$ .

*General self-esteem:* To assess self-esteem, the 10-item General Self subscale of the Self-Description Questionnaire II (SDQ-II; Marsh, Parker, & Barnes, 1985) was used. Example items are “Overall, I have a lot to be proud of” and “Overall, I am a failure” (negatively worded item). Responses were made on a scale ranging between 1 (*false*) to 6 (*true*). Past research has supported the construct validity and internal consistency of this measure (Marsh et al., 1985).

*HRQoL:* HRQoL was assessed using the Pediatric Quality of Life Questionnaire (PedsQL 4; Varni et al., 1999). Previous work has found the PedsQL 4 to be a reliable and valid measure of HRQoL in adolescent populations (Schwimmer, Burwinkle, & Varni, 2003; Varni, Seid, & Kurtin, 2001). The PedsQL comprises of 23 items that are split into four domains; physical (8 items; e.g., “It is hard for me to run”), social (5 items; e.g., “Other kids tease me”), emotional (5 items; e.g., “I feel sad or blue”), and school (5 items; e.g., “It is hard to pay attention in class”). Responses were made on a 5-point Likert scale, ranging from 0 (*never a problem*) to 4 (*almost always a problem*). Items were reversed-scored and linearly transformed to a 0 to 100 scale (i.e., 0 = 100, 1 = 75, 2 = 50, 3 = 25, and 4 = 0). The item scores are then divided by the number of item responses to provide a scale score. A total “HRQoL” composite score was also calculated with higher scores indicating better HRQoL. For the purpose of testing the competing SEM models, we used the four HRQoL domain (i.e., physical, emotional, social, and school) scores as indicators of the latent factor “HRQoL.”

## Results

### *Descriptive statistics*

Table 1 contains the means, standard deviations, and  $\alpha$  coefficient values (Cronbach, 1951) for all measures. As shown,  $\alpha$  coefficients ranged from .73 to .89. The inter-correlation matrix is also presented in Table 1. An inspection of the bivariate correlations revealed that perceptions of an autonomy-supportive context were positively associated with autonomy, competence, relatedness, autonomous motivation, self-esteem, HRQoL (total), and all HRQoL domains. Autonomy, competence, and relatedness were all positively associated with autonomous motivation, and self-esteem. Relatedness and competence were positively correlated with HRQoL (total). Relatedness was positively associated with the social, school, and emotional facets of HRQoL. Competence was positively related to the physical and social domains of HRQoL. Autonomy was positively associated with the social domain of HRQoL. Autonomous motivation corresponded positively with self-esteem, HRQoL (total), and the physical, social, school, and emotional domains of HRQoL. Self-esteem was positively related to reported HRQoL (total) and the physical, social, school, and emotional facets of HRQoL. Finally, and as would be expected, the HRQoL domains were strongly correlated with HRQoL (total).

Table 1  
Descriptive statistics and bivariate correlations among the study variables

Subscale	<i>M</i>	<i>SD</i>	$\alpha$	1	2	3	4	5	6	7	8	9	10	11
(1) Autonomy support	4.70	1.18	.73	—										
(2) Relatedness	4.70	1.36	.89	.49	—									
(3) Competence	4.52	.96	.80	.26	.36	—								
(4) Autonomy	3.75	1.43	.86	.64	.50	.35	—							
(5) Autonomous motivation	4.55	5.70	—	.46	.37	.40	.48	—						
(6) Self-esteem	4.16	.80	.83	.24	.23	.41	.19	.34	—					
(7) HRQoL (total)	75.96	15.04	.89	.20	.24	.14	.05	.31	.37	—				
(8) Physical domain (HRQoL)	83.71	16.23	.81	.12	.04	.16	-.04	.25	.31	.71	—			
(9) Social domain (HRQoL)	80.21	20.01	.84	.22	.35	.17	.11	.30	.32	.81	.48	—		
(10) School domain (HRQoL)	63.08	20.41	.74	.12	.11	.03	.06	.19	.21	.71	.33	.40	—	
(11) Emotional domain (HRQoL)	76.84	21.71	.83	.15	.19	.07	.05	.22	.30	.82	.46	.59	.40	—

Note: Bivariate correlations of .11 and above are significant at  $p \leq .05$ ; bivariate correlations of .15 and above are significant at  $p \leq .001$  level.

### Structural equation modelling analysis

The adequacy of the proposed models (Fig. 1) were analysed using Version 6.1 of EQS (Bentler, 2004). An inspection of the Mardia's normalized multivariate coefficients for each model showed the data not to be normally distributed. Accordingly, the data were analysed using Satorra and Bentler's (1994) scaling correction of the maximum likelihood chi-square ( $\chi^2$ ).

The fit of the proposed models to the data were examined using the 2-index presentation strategy proposed by Hu and Bentler (1999). This approach advances the use of the Standardized Root Mean Square Residual (SRMR) coupled with one or more incremental or absolute index of fit. In the present work, we chose to supplement the SRMR with the Comparative Fit Index (CFI), Incremental Fit Index (IFI), and the Root Mean Square Error of Approximation (RMSEA). For incremental indices such as the CFI and IFI, values of over .90 are indicative of an *acceptable* fit, whereas values of close to (or above) .95 represents an *excellent* fit between the model and data (Bentler, 1995; Hu & Bentler, 1999). Values close to .08 (or lower) and .06 (or lower) are indicative of well-specified models for the SRMR and RMSEA, respectively (Hu & Bentler, 1999).

It was not possible to perform a full latent analysis of the hypothesized models as the sample size was not sufficiently large to meet the required number of cases per estimated parameter. As such, and aligned with past work that has tested complex models of motivational processes (e.g., Reinboth et al., 2004), we used the parcelling technique. With the exception of the latent factor HRQoL which was indexed by four subscales (i.e., physical, emotional, social, and school), we randomly created parcels of items to form two indicators for each latent factor. By adopting this approach, our ratio of approximately 5:1 participants per estimated parameter was adequate (Bentler & Chou, 1987). Finally, as one of the models in the present work was non-nested, it was inappropriate to use the  $\chi^2$  difference test to compare the models. Thus, we employed the Consistent Akaike Information Criterion (CAIC) to compare the degree of parsimony in the

competing models. For CAIC, small values signify a better, more parsimonious model fit (Ullman, 2007). These values may also be reflected by the largest negative value. Finally, the proportion of variance that was explained by the independent variable(s) for the dependent variable of interest was assessed using  $R^2$ .

To assess model fit, a two-step model building approach advanced by Anderson and Gerbing (1988) was employed. Step one involves the testing of the measurement model via CFA. Results revealed an excellent fit between the model and the data [Satorra-Bentler  $\chi^2$  (83) = 151.26,  $p < .001$ ; CFI = .96; IFI = .96; SRMR = .046; RMSEA = .052]. The second stage of the model building approach pertains to an examination of the three proposed models outlined in Fig. 1. All models revealed a very good fit to the data, but there was room for improvement [*Model 1*: Satorra-Bentler  $\chi^2$  (94) = 229.03,  $p < .001$ ; CFI = .93; IFI = .93; SRMR = .072; RMSEA = .069; CAIC = -401.13; *Model 2*: Satorra-Bentler  $\chi^2$  (94) = 250.63,  $p < .001$ ; CFI = .92; IFI = .92; SRMR = .091; RMSEA = .070; CAIC = -379.52; *Model 3*: Satorra-Bentler  $\chi^2$  (93) = 228.43,  $p < .001$ ; CFI = .93; IFI = .93; SRMR = .072; RMSEA = .070; CAIC = -395.03]. Modification indices (MI) were explored and considered from a theoretical perspective as opposed to being data driven (cf. McDonald & Ho, 2002). An inspection of the MIs suggested that for all three proposed models a path be added from competence to self-esteem, and from relatedness to HRQoL. Both these additions were judged appropriate based on past work (e.g., Baumeister & Leary, 1995; Ebbeck & Weiss, 1998; Fox, 1997). Further, the hypothesized path from relatedness to autonomous motivation was not significant and was therefore dropped. The models were reanalyzed and results demonstrated all models to provide an excellent fit to the study data [*Model 1*: Satorra-Bentler  $\chi^2$  (92) = 180.74,  $p < .001$ ; CFI = .95; IFI = .95; SRMR = .060; RMSEA = .057; CAIC = -436.01; *Model 2*: Satorra-Bentler  $\chi^2$  (92) = 173.26,  $p < .001$ ; CFI = .96; IFI = .96; SRMR = .059; RMSEA = .054; CAIC = -443.49; *Model 3*: Satorra-Bentler  $\chi^2$  (91) = 173.18,  $p < .001$ ; CFI = .96; IFI = .96; SRMR = .059; RMSEA = .055; CAIC = -436.86]. The standardized parameters and  $R^2$  values for each model are shown in Table 2.

The standardized parameters showed that for all three models, perceptions of an autonomy-supportive PE environment positively predicted autonomy, competence, and relatedness (supporting  $H_1$ ). Autonomy and competence positively predicted autonomous motivation towards PE in the three models (partially supporting  $H_2$ ). For all models, autonomous motivation towards PE positively predicted HRQoL and/or general self-esteem as assessed at Time 2 (supporting  $H_3$ ). With regard to Time 2 variables, a positive path from self-esteem to HRQoL was found for Model 1 (supporting  $H_4$ ), a positive path from HRQoL to self-esteem was supported in Model 2 (supporting  $H_5$ ), and support for a significant covariance between HRQoL and self-esteem was found for Model 3 (supporting  $H_6$ ).

The indirect effects for the three models are shown in Table 3. For all models, autonomy support positively influenced autonomous motivation, through autonomy and competence and general self-esteem and HRQoL via autonomy, competence, and autonomous motivation. Both autonomy and competence had a positive indirect effect on general self-esteem and HRQoL. In Model 2, relatedness had a positive indirect effect on general self-esteem via HRQoL. The indirect effect of autonomous motivation, through general self-esteem was not significant ( $p = .061$ ) (Model 1). Finally, in Model 2 autonomous motivation had a positive indirect effect on general self-esteem through HRQoL.

Table 2  
Standardized parameter estimates and  $R^2$  values for the final models

	Model 1	Model 2	Model 3
<i>Standardized parameter estimates</i>			
Autonomy support → competence	.29	.30	.30
Autonomy support → autonomy	.70	.70	.70
Autonomy support → relatedness	.57	.56	.56
Competence → autonomous motivation	.39	.40	.40
Autonomy → autonomous motivation	.40	.40	.40
Autonomous motivation → general self-esteem	.17	—	.16
Autonomous motivation → HRQoL	—	.30	.30
General self-esteem → HRQoL	.39	—	—
HRQoL → general self-esteem	—	.31	—
HRQoL → general self-esteem	—	—	.37
Competence → general self-esteem	.56	.59	.59
Relatedness → HRQoL	.19	.20	.18
<i>R<sup>2</sup> values</i>			
Competence	.09	.09	.09
Autonomy	.49	.49	.49
Relatedness	.32	.32	.32
Autonomous motivation	.44	.44	.44
Self-esteem	.45	.54	.47
HRQoL	.23	.17	.17

Note: All standardized parameter estimates are significant ( $p < .05$ ).

Table 3  
Standardized parameter estimates of indirect effects for the final models

Parameter	Model 1	Model 2	Model 3
<i>Indirect effects</i>			
Autonomy support → autonomous motivation	.40*	.40*	.40*
Autonomy support → general self-esteem	.23*	.25*	.24*
Autonomy support → HRQoL	.20*	.23*	.22*
Autonomy → general self-esteem	.07*	.04*	.06*
Autonomy → HRQoL	.03*	.12*	.12*
Competence → general self-esteem	.07*	.04*	.06*
Competence → HRQoL	.25*	.12*	.12*
Relatedness → general self-esteem	—	.06*	—
Autonomous motivation → HRQoL	.07	—	—
Autonomous motivation → general self-esteem	—	.09*	—

Note: \*Denotes a significant indirect effect ( $p < .05$ ).

## Discussion

The main purpose of the present work was to test three models of motivational processes grounded in SDT that linked PE-related responses to students' general self-esteem and reported HRQoL. In general, the SEM analyses provided support for the proposed paths which were

guided by SDT and past work (see Fig. 1). Following two minor modifications, all three models showed excellent fit to the study data. A substantial amount of variance was explained in general self-esteem (i.e., 45%, 54%, and 57% for Models 1, 2, and 3, respectively) and a notable amount of variance explained for in HRQoL (i.e., 23%, 17%, and 17% for Models 1, 2, and 3, respectively) by the proposed models of motivational processes specific to PE. Such findings reinforce the implications that (i) motivational processes towards PE may have for global indices of psychological well-being such as general self-esteem and HRQoL and (ii) the potential that the theoretical tenets of SDT have for guiding such work.

SDT proposes that autonomy-supportive environments lead to increases in self-determined motivation because they satisfy an individual's basic needs for autonomy, competence, and relatedness. With respect to the teacher-created social context, the findings from the present work revealed that student perceptions of their PE teacher as being autonomy-supportive were positively related to reported levels of autonomy, competence, and relatedness. Moreover, indirect effects showed autonomy support to positively and significantly influence autonomous motivation, general self-esteem, and HRQoL. Collectively, the present findings are consistent with SDT and past research in PE (e.g., Standage et al., 2006) and highlight the benefits that students gain from interactions with autonomy-supportive teachers.

At the core of SDT is the proposition that basic psychological need satisfaction underpins autonomous motivation, learning, well-being, and optimal functioning. In the present study we found competence and autonomy to be positive predictors of autonomous motivation towards PE. Contrary to previous findings (e.g., Standage et al., 2003, 2006), relatedness did not emerge as a significant predictor of autonomous motivation towards PE in any of the proposed models. While in contrast to our hypothesis, the finding is aligned with Deci and Moller's (2005) and Deci and Ryan's (2000) proposition that relatedness plays a more distal role than autonomy and competence in enhancing and maintaining intrinsic motivation. That is, Deci and Ryan (2000) suggest that a backdrop of secure relationships that provide distal support can be sufficient to fulfill the need for relatedness even when proximal supports are absent. Accordingly, a pupil who generally experiences a secure base for his/her relatedness may not need to experience domain specific relatedness towards PE to experience autonomous motivation. This said, while the need for relatedness may not be considered as integral to intrinsic motivation (Deci & Ryan, 2000), it is considered important in providing a foundation for the autonomous regulation of extrinsically motivated actions (i.e., the internalization of activities). Because PE encompasses activities that are desirable but not always intrinsically interesting to all students, longitudinal work exploring the relations between relatedness and the motivational types embraced by SDT would provide us with valuable information pertaining to the role that relatedness plays alongside autonomy and competence in promoting autonomous motivation to students who act for external or introjected reasons.

Both autonomy and competence had a positive indirect effect on general self-esteem and HRQoL. Moreover, in Model 2 relatedness had a positive indirect effect on general self-esteem via HRQoL. Such findings corroborate SDT's proposition that the satisfaction of the universal and innate needs of autonomy, competence, and relatedness represent essential nutrients for psychological health and well-being (Ryan & Deci, 2000).

MI's suggested a direct path from perceived competence to general self-esteem. This path was added to the models based on findings from the extant literature (cf. Fox, 1997). For example, in a

group of 183 children from a summer camp sports programme Ebbeck and Weiss (1998) found that 49% of the variance in self-esteem was explained by reported levels of perceived competence. Although the direct path from competence to general self-esteem was moderate in strength across the three models, it is important to note that according to SDT merely being competent is not sufficient to experience human agency or true self-esteem (cf. Deci & Ryan, 1995).

The MIs also suggested a direct path between relatedness and HRQoL. This path was added to the models based on the fact that SDT posits that relatedness is associated with positive health and well-being. While past work grounded in SDT has not directly linked relatedness to HRQoL, previous research has shown an individuals' sense of belongingness to be positively associated to indices aligned to those of domains subsumed in HRQoL measures (e.g., social and emotional). Specifically, past work has shown that having positive and caring interactions with others to be positively associated with emotional responses, well-being, and friendship quality (see Baumeister & Leary, 1995 for a review). Thus, our results are aligned with SDT and past findings by revealing that there is much to be gained from secure and stable interpersonal relationships.

Based on SDT and past work (e.g., Hein & Hagger, 2007), we hypothesized that autonomous motivation towards PE would predict general self-esteem. Aligned with Deci and Ryan's (1995) theorizing that stable self-esteem will only be enhanced when an individual's actions are self-determined, we found autonomous motivation towards PE to positively predict general self-esteem. Not only does this finding support the theoretical proposition that self-determined motivation yields adaptive motivational responses, but it also provides credit for the argument that the PE context can impact on global perceptions of self. It should be noted that while we found a positive relationship between autonomous motivation and general self-esteem (i.e., overall perceptions of self), similar to past work (e.g., Wilson & Rodgers, 2002) our design was not such that we could detect differences in true (i.e., a stable and solid sense of one's self) and contingent (i.e., self-esteem that is dependent on meeting some standard of excellence or living up to expectations) self-esteem. As SDT posits different consequences as a function of true or contingent self-esteem, researchers should employ longitudinal and/or experimental designs in an attempt to explore the relations among the motivational regulations embraced by SDT and the "true" versus "contingent" self-esteem distinction.

Consistent with our hypothesis and similar to past work addressing QoL (e.g., Gillison et al., 2006), the positive paths between autonomous motivation toward PE and HRQoL for Models 2 and 3 provide preliminary evidence that HRQoL can be affected by domain specific motivation. Autonomous motivation towards PE was also positively related with the social, school, physical, and emotional domains of HRQoL. As autonomous regulation has repeatedly been linked to positive behaviours and mental health (cf. Deci & Ryan, 2000), the mechanism by which motivation towards PE impacts on HRQoL and its subdomains may be through repeated positive behaviours and/or experiences at the contextual level. That is, since autonomous functioning has been linked with quality engagement, active involvement, and persistence in PE it may be that students (i) increase their physical health and functioning, (ii) form, maintain, and/or strengthen social relationships, (iii) develop attentional skills that are generalizable across school subjects, and (iv) experience positive emotions in the context of PE. Future work testing the bottom-up hypothesis proposed by Vallerand's HMIEM would provide valuable insight into this question. Such work would also do well to test whether the relationship between autonomous motivation towards PE and HRQoL is mediated by one's global motivation.

A further issue pertaining to level of assessment as defined by hierarchical models of the self (cf. Fox, 1997) resided with our measure of general self-esteem. That is, in the present work we explored the relationship between PE-related variables and the students' general self-esteem. The hierarchical nature and assessment of self-esteem models (cf. Fox, 1997) would suggest that domain specific perceptions of the self (i.e., physical self-worth) would have stronger effect on assessments taken within and/or towards the PE context. Accordingly, future work would do well to explore whether perceptions of the physical self mediate the "PE motivational processes—general self-esteem" relationship. Such work would provide an important insight into the underpinning mechanisms of the self-system within the context of school PE.

The three SEM models that were tested in the present work all revealed excellent fit to the study data. Based on fit indexes and CAIC values, Model 2 was shown to marginally fit the data best. However, it is important to consider that Model 2 demonstrated a marginally worse fit to the data prior to the two modifications compared to Model's 1 and 3. As generalization and interpretation from post hoc analyses should be viewed with caution as such an approach may not cross-validate well to other samples (e.g., MacCallum, Roznowski, & Necowitz, 1992), it is clear that future work is needed to ensure that the present findings did not capitalize on chance. Moreover, the correlational nature of this study precludes determination of causality. As such, until appropriately designed work teases out the directionality between motivation, HRQoL, and self-esteem it may be more appropriate for cross-sectional work to adopt the approach used in Model 3 (i.e., consider self-esteem and HRQoL as related yet independent dependent variables).

Future work addressing the causal links between self-esteem and HRQoL would appear to be a pressing issue from both conceptual and applied perspectives. Using longitudinal and/or experimental research designs, future work testing whether self-esteem is a predictor or outcome variable of HRQoL would be particularly informative. Baumeister et al. (2003) argue that if self-esteem produces a number of positive outcomes, then substantial efforts and expense to nurture self-esteem would appear warranted, however, if it is an outcome of successful engagement in an activity or behaviour, then there is little to be achieved by attempting to raise self-esteem. Of course, according to SDT it is not merely the quantity of self-esteem that counts but the type of self-esteem, thus, work addressing causal effects would do well to explore the "true" and "contingent" aspects of self-esteem.

A limitation of this work was that we used the SDI approach to provide information regarding the level to which the students' motivation towards PE was autonomous. Although it would have been insightful to have modelled all motivational regulations independently, it has been argued that the SDI facilitates an adequate test of comprehensive SEM models such as the one examined in the present investigation (Vallerand, 1997). However, while useful in reducing the number of indicators in SEM models, such an approach may mask some important information, especially in terms of an insight into which motivational regulation(s) is/are the best predictor(s) of the dependent variable(s) of interest (Vallerand, 1997).

## **Conclusion**

In view of a lack of research exploring the relationship among school PE, general self-esteem and HRQoL, this paper makes a unique contribution to the literature by showing that while only

a small aspect of a child's life, motivational processes within school PE can play a role in enhancing students' reported levels of global psychological well-being. While the present work highlighted a number of important interrelationships among motivational processes toward PE, general self-esteem, and HRQoL, the design was not such that clear conclusions could be formulated. As such, future work using more appropriate methodologies (e.g., longitudinal designs) would make important contributions to the field of exercise and health psychology by providing a clearer insight into the relations among motivational processes toward PE and global indices of psychological well-being. To this end, it is our hope that this paper has played a small role in encouraging such needed and meaningful lines of enquiry.

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