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A domain-specific approach for assessing physical activity efficacy in adolescents: From scale conception to predictive validity

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ABSTRACT

Objective: To develop and test the utility of a domain-specific *physical activity efficacy* scale in adolescents for predicting physical activity behaviour.
Design: Two independent studies were conducted. Study 1 examined the psychometric properties of a newly constructed Domain-Specific Physical Activity Efficacy Questionnaire (DSPAEQ) and study 2 tested the utility of the scale for predicting leisure- and school-time physical activity.
Methods: In study 1, descriptive physical activity data were used to generate scale items. The scales factor structure and internal consistency were tested in a sample of 272 adolescents. A subsequent sample of Canadian ($N = 104$) and New Zealand ($N = 29$) adolescents, was recruited in study 2 to explore the scale's predictive validity using a subjective measure of leisure- and school-time physical activity.
Results: A principle axis factor analysis in study 1 revealed a 26-item, five-factor coherent and interpretable solution; representative of leisure and recreation, household, ambulatory, transportation, and school physical activity efficacy constructs, respectively. The five-factor solution explained 81% of the response variance. In study 2 the domain-specific efficacy model explained 16% and 1% of leisure- and school-time physical activity response variance, respectively, with *leisure time physical activity efficacy* identified as a unique and significant contributor of leisure-time physical activity.
Conclusion: Study 1 provides evidence for the tenability of a five factor DSPEAQ, while study 2 shows that the DSPEAQ has utility in predicting domain-specific physical activity. This latter finding underscores the importance of scale correspondence between the behavioural elements (leisure-time physical activity) and cognitive assessment of those elements (*leisure-time physical activity efficacy*).
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Introduction

Evidence of decreased time spent in physical activity among today's youth (Colley et al., 2011; Dumith, Gigante, Domingues, & Kohl, 2011; Janssen et al., 2005) highlights the need to identify effective strategies for promoting physical activity in this population. In order to develop effective strategies to improve physical activity, the theoretical determinants of the behaviour should be well understood (Baranowski, Anderson, & Carmack, 1998). Self-efficacy, a central component of Bandura's Social Cognitive Theory (Bandura, 1986), has been advanced as an important personal determinant of human behaviour. Self-efficacy can be defined as an individual's beliefs regarding their ability to engage in behaviours that lead to expected outcomes (Bandura, 1995, 1997).

A review of physical activity correlates in youth (Van der Horst, Paw, Twisk, & Van Mechelen, 2007) found that self-efficacy was positively associated with physical activity in adolescents aged 13–18 years. This contrasts an earlier review by Sallis, Prochaska, and Taylor (2000) which found mixed support for self-efficacy as a correlate in this age group. In this review, some studies found a positive relationship between self-efficacy and physical activity (Reynolds et al., 1990; Trost et al., 1996; Zakarian, Hovell, Hofstetter, Sallis, & Keating, 1994) while others did not (Bungum & Vincent, 1997; Dilorenzo, Stucky-Ropp, Van der Wal, & Gotham, 1998; Garcia et al., 1995). Closer examination of the self-efficacy measures used in the included studies highlighted that a number of different types or components of self-efficacy were examined. For example, the self-efficacy measure used by Wu and Pender (2002) and Wu,

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Pender, and Noureddine (2003) among Taiwanese adolescents asked questions about engaging in regular physical activity in the face of various conflicting conditions (e.g., being tied up with family chores). Dilorenzo et al. (1998) surveyed participants' beliefs in their ability to be active relative to peers. Ryan and Dzewaltowski (2002) examined four types of self-efficacy among adolescents: efficacy for being physically active, for overcoming barriers to physical activity, for asking others to be active with them, and for finding and creating environments that support physical activity. Finally, Strauss, Rodzilsky, Burack, and Colin (2001) asked adolescents' to rate their confidence for seeking social support for physical activity, for overcoming barriers to physical activity, and for being active despite positive alternatives, such as their friends wanting to do something else.

The inconsistent support for the relationship between self-efficacy and physical activity among adolescents may be due to a lack of consistent or standard measurement of self-efficacy across studies and/or the inappropriate analyses conducted for these review papers in which results for different measures of self-efficacy were combined as a single construct. Theoretically, differences between types of self-efficacy are important for gaining a complete understanding of the relationship between self-efficacy and physical activity. McAuley and Mihalko (1998) suggest that self-efficacy measures generally represent one of two broad categories or components of the self-efficacy construct; namely, a *task* component or a *regulatory* component. The *task* component, which is the primary focus of this work, refers to beliefs an individual has about his or her simple motor skills or ability to perform a specific behaviour. By definition, this suggests that an individual can feel more or less efficacious in different situations and/or for particular tasks (Bandura, 2006). Studies with children and adolescents have shown that *physical activity efficacy* – a general measure of self-efficacy – modestly predicts both subjectively and objectively measured physical activity (Foley et al., 2008; Roberts, Maddison, Magnusson, & Prapavessis, 2010). Generalized measures have limited predictive or explanatory power due to the ambiguity concerning the exact tasks (or types of physical activity) that are being assessed (Bandura, 2006). Furthermore, in the past *physical activity efficacy* was assessed using a single-item measure, in which adolescents were asked how confident they were that they could engage in vigorous exercise for 20 min or more on 3 or more days of the week. A single-item approach contradicts the recommended guidelines for assessing *task* efficacy, which suggests there should be a hierarchy of items to properly gauge both the level and strength one's efficacy beliefs (McAuley & Mihalko, 1998).

As previously stated *task* efficacy is not a global trait but a situation specific trait. While different physical activities may require individuals to perform the same fundamental movement skills (e.g., run, jump, throw), one should not assume physical activity deemed important in one context will be similarly important in another context. Furthermore, it is important that *physical activity efficacy* measures correspond with the behaviour (i.e., types of physical activity) assessed (Bandura, 2006; McAuley & Mihalko, 1998). Methods for measuring physical activity continue to evolve. Researchers are not only interested in better understanding physical activity level but also better understanding the types of activities youth perform. To improve the level of correspondence with physical activity outcomes, previous research has suggested using a domain-specific approach to assess self-efficacy (Schwarzer, Babler, Kwiatek, & Schroder, 1997). A similar approach has been utilized for measuring other psychosocial predictors of human behaviour (e.g., life satisfaction; Fugl-Meyer, Eklund, & Fugl-Meyer, 1991). A domain-specific approach for assessing *physical activity efficacy* may be particularly advantageous when utilized in conjunction with measures of physical activity in multiple domains (e.g., at school, home, during one's leisure time and for transportation; Crocker, Bailley, Faulkner, Kowalski, & McGrath, 1997; Ridley, Olds, & Hill, 2006). This approach may capture more of the response variance in physical activity measures, strengthening the case for *physical activity efficacy*, and specifically domain specific *physical activity efficacy* as a target construct in interventions promoting physical activity in adolescents.

The overall purpose of this study was to develop a conceptually based and psychometrically sound domain-specific *physical activity efficacy* questionnaire (DSPAEQ) to assess efficacy in each of the main physical activity domains adolescents engage in (i.e., at school, at home, during leisure time, and for transportation purposes). Guided by classical measurement theory (Simms, 2008), two fundamental concerns for the scale were examined (a) does the instrument measure the constructs it is intended to measure; and (b) does the instrument measure the constructs with consistency? These two questions represent the instrument's validity and reliability, respectively. To provide preliminary evidence for these two key psychometric properties, this study focused on the content of item development (i.e., adequacy of the items that operationally define the constructs being assessed) as well as the factor analytical structure and composition, and internal consistency of the constructs generated from the items (Simms, 2008).

Methods – study 1

Participants and procedures

Two independent samples of high school students were recruited from secondary institutions within South Western Ontario, Canada. Data from sample 1 were used in the item generation portion of scale construction and data from sample 2 were used to assess the factor structure and composition as well as the internal consistency of the DSPAEQ. Ethical approval was obtained from the University of Western Ontario Research Ethics Board (REB#17296S; REB#18182E). In addition, permission was granted to conduct research from the participating school boards. Participants were contacted via a designated teacher at each institution. For both samples, parents and students received a paper copy of a detailed letter of information clearly outlining the study information and procedures. Prior to participation, participant informed consent was obtained for individuals eighteen years of age or older. Parent consent and student assent was obtained for participants under the age of 18 years.

Scale conception and item generation

Authors were interested in creating efficacy items in four main domains of physical activity: (1) school, (2) household, (3) transportation, and (4) leisure-time (Arvidsson, Slinde, & Hulthen, 2005). A better understanding of the type(s) of activities that are performed regularly by adolescents within each domain was needed to identify the physical activities the efficacy items should collectively target. In addition, to properly gauge the level and strength of adolescents' efficacy beliefs, an understanding of the intensity and duration of each type was needed. A survey was conducted with adolescents [$N = 174$; mean age = 15.5 ($SD = 1.3$) years; 66% female; 86% Caucasian] in which participants identified the types of physical activity they engaged in on a regular basis (i.e., three or more days per week) in each of the four physical activity domains identified. An exception was made for household activities, as household chores were anticipated to be performed fewer than three times per week. Participants also reported the average duration (minutes) and intensity level (light, moderate, or hard) they performed each activity.

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