Psychology of Sport and Exercise 23 (2016) 90–100

Contents lists available at ScienceDirect

Psychology of Sport and Exercise

journal homepage: www.elsevier.com/locate/psychsport

Using self-determination theory to understand motivation for walking: Instrument development and model testing using Bayesian structural equation modelling

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ARTICLE INFO

Article history:
Received 18 June 2015
Received in revised form
17 November 2015
Accepted 17 November 2015
Available online 21 November 2015

Keywords:
Walking
Self-determination theory
Motivation
Psychology
Physical activity
Bayesian structural equation modeling

ABSTRACT

Objective: The motivational processes underpinning walking behaviour are not well understood. This study aimed to develop walking-specific motivation measures drawn from self-determination theory (SDT), assess the psychometric properties of the measures, incorporating Baysesian structural equation modelling (BSEM), and examine how these variables relate to walking behaviour.
Method: Participants (n = 298; mean age = 41.69; S.D. = 11.06; male = 57) completed the Behavioural Regulations in Walking Questionnaire (BRWQ), Psychological Needs Satisfaction for Walking Scale (PNSWS) and the IPAQ-long form, from which measures of workplace, transport and leisure walking were extracted. BSEM was used to test the hypothesized factor structures of the BRWQ and PNSWS. Internal reliabilities were assessed using the composite reliability coefficient. Convergent and discriminant validity were assessed by examining the relationships between the variables in relation to established theory.
Results: BSEM showed excellent fit for the BRWQ and PNSWS measurement models. The scales demonstrated good internal consistency. The associations within and between the BRWQ and PNSWS subscales were generally as expected. The relationship between the BRWQ subscales and walking for transport and leisure were also generally as expected, but there were no significant relationships for walking at work. Two PNSWS subscales were significantly related to walking for leisure, but no significant relationships were evident for walking for transport and at work.
Conclusions: There is preliminary evidence for the acceptable psychometric properties of instruments to measure SDT constructs in walking, and the findings highlight the advantages of BSEM. The findings also suggest that the motivational processes underpinning walking may vary by type of walking.

1. Introduction

Walking is a physical activity behaviour that can be undertaken in the different domains of work, home and community, and for different reasons such as transport, recreation, exercise and health. Regardless of the location and purpose behind walking, it has established health benefits (Murphy, Donnelly, Shibli, Foster, & Nevill, 2012; Murphy, Nevill, Murtagh, & Holder, 2007; Murtagh et al., 2015), even at relatively low levels (Ekelund et al., 2015). Moreover, walking has been identified as the 'nearest activity to perfect exercise' (Morris & Hardman, 1997) because of its health benefits and also because it requires no special skills or equipment, and is convenient and accessible to many people. For these reasons, increased walking has been identified as the most likely way that adults can achieve healthy levels of physical activity. Walking has become a key component of many physical activity promotion strategies (e.g., Bull et al., 2010), in which authors advocate creating opportunities for people to have physically active lifestyles.

In order to effectively promote walking, there is a need to identify the determinants of walking behaviour (Sallis, Owen, & Fotheringham, 2000). In line with the social ecological model (Sallis, Owen, & Fisher, 2008) it is likely that walking behaviour is influenced by individual, social and physical environmental, and policy factors. From an individual perspective, motivation is an

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http://dx.doi.org/10.1016/j.psychsport.2015.11.004
1469-0292/

individual's drive to act and is clearly a key influence on behaviour; however, few researchers have considered walking behaviour from a theoretical perspective. Whilst a number of psychological theories of motivation exist, self-determination theory (SDT) (Ryan & Deci, 2000) has become increasingly popular in the field of physical activity (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). SDT offers a comprehensive explanatory framework to study antecedents and outcomes of motivation to be physically active (Ng et al., 2012), incorporating many of the variables that have been identified as being relevant to physical activity (Sebire, Jago, Fox, Edwards, & Thompson, 2013). A further strength of SDT is that it can be readily applied to physical activity interventions (Standage & Ryan, 2012). Although limited research has examined walking behaviour from a SDT theoretical basis, a recent qualitative study showed that SDT offers researchers a relevant perspective for understanding adoption of walking for physical activity (Kinnafick, Thogersen-Ntoumani, & Duda, 2014).

1.1. Self-determination theory

SDT is a macro theory of human motivation that includes five mini-theories (Ryan & Deci, 2000). One mini-theory is organismic integration theory (OIT; (Deci & Ryan, 2000) that considers not just the *amount* of motivation an individual has towards behaviour but also the *quality* of the motivation, which results in different outcomes. According to OIT, there are three types of motivation including intrinsic and extrinsic motivation, and amotivation. Specifically, intrinsic motivation is based on inherent interest and satisfaction from the activity (e.g., I walk because it is fun). Integrated, identified, introjection and external behavioural regulations are all forms of extrinsic motivation because they focus on consequences that are separate from the activity itself. Integrated regulations relate to engaging in the activity because it is *integrated* with the individual's goals and values (e.g., I consider walking to be part of my identity). Identified regulations are based on consciously valuing and *identifying* with the benefits of the activity (e.g., I value the benefits of walking). Intrinsic, integrated and identified regulations are all considered autonomous forms of motivation. Introjected regulations are based on being motivated to avoid feelings of guilt, or to enhance one's self-worth (e.g., I walk because I feel guilty if I don't). External regulations relate to being motivated to obtain an external contingency (e.g., I walk because other people say I should). Both external and introjected behavioural regulations are associated with controlled forms of motivation, where behaviour is governed by external or internal pressures. Finally, amotivation relates to a lack of intention to act and a lack of motivation.

These different types of motivation are often conceptualised as lying along a continuum of relative autonomy (Ryan & Connell, 1989). According to this conception, correlations between measures of behavioural regulations should exhibit a simplex pattern whereby motivation types more proximally located on the continuum are more strongly associated than with those more distally located. In fact, such SDT-based measures often do not conform to this pattern (Guay, Morin, Litalien, Valois, & Vallerand, 2015). Chemolli and Gagne (2014) argued that the continuum conception, with the regulatory types ordered along a single dimension representing individual differences in autonomy, is not consistent with the idea that the forms of regulation described by SDT are qualitatively different, nor with the fact that individuals can endorse more than one form of regulation for a behaviour at the same time. Using Rasch analysis, these authors found no support for the continuum conception for measures of behavioural regulation in the work and academic domains.

Within SDT, it is hypothesised that more autonomous motivation is associated with adaptive cognitive, affective and behavioural outcomes, whereas controlled motivation is associated with maladaptive outcomes (Deci & Ryan, 2000). A recent systematic review of 53 exercise studies provided some support for these hypotheses in relation to the outcome behaviour of exercise (Teixeira et al., 2012). Specifically, there was consistent evidence to support a positive predictive relationship between all autonomous forms of regulation and exercise behaviour. However, the findings for controlled motivation were less clear with the majority of studies reporting no relationships between external and introjected regulation and exercise behaviour, but other studies reporting either positive or negative relationships.

Whilst this systematic review is of value and adds some support for the use of SDT in understanding exercise behaviour, it was noted by the authors that the large majority of the studies focused on 'exercise' (i.e., 'a purposeful and formalized leisure time activity, often with the goal of improving fitness and health'; p.27 (Teixeira et al., 2012)) as an outcome variable. However, there are differences between formalized exercise, and the cluster of behaviours that can be classified as walking. Although walking can be undertaken as purposeful exercise, it can also include walking for transport, recreation or health, and whilst at work, in the community or at home. Furthermore, opportunities for walking may occur more regularly, be of shorter duration and generally require less physical effort than a formalized exercise bout. Therefore, it may be premature to extrapolate the findings of exercise studies to inform the promotion of the activity of walking within a physically active lifestyle.

Researchers have undertaken limited walking specific studies to examine behavioural regulations; however other studies have shown that the hypothesized relationships between behavioural regulations and physical activity are evident for structured and strenuous exercise, but not for lifestyle physical activity behaviours (e.g., walking instead of taking motorized transport, easy walking) or mild exercise in the same sample (Edmunds, Ntoumanis, & Duda, 2006a, 2006b; Silva et al., 2010; Vlachopoulos, Ntoumanis, & Smith, 2010). As suggested by Silva et al. it is possible that engaging in lifestyle behaviours may require less cognitive effort and therefore be regulated by more automatic and habitual processes (Silva et al., 2010). However, although lifestyle behaviours like walking may become habitual over time, they would not be automatic at the adoption stage (Verplanken & Melkevik, 2008). Furthermore, some forms of walking, such as deliberately choosing to walk for leisure or for transport may be more purposeful than others, such as incidental walking associated with one's occupation. Therefore understanding the contribution of more deliberative processes like behavioural regulations to purposeful walking behaviours is likely to be important in effectively promoting walking, and worthy of further research. Additionally, it is also evident that there were methodological issues with each of these studies that may partly explain the lack of associations. Specifically, each study used measures of behavioural regulations that related to exercise, and not the targeted behaviour of lifestyle physical activity. This lack of correspondence between the predictor and target behaviour could partly explain the lack of associations. In order to credibly investigate the role of behavioural regulations in walking behaviour it is necessary to develop appropriate instruments.

1.2. Basic needs theory

SDT has particular value in its application to physical activity promotion because it identifies the conditions that underpin the nature of motivation and those that will nurture or thwart more adaptive autonomous motivation. According to the mini-theory of basic needs theory (BNT), all individuals have an innate need to feel autonomous, competent and related to others in their social environment (Deci & Ryan, 2000). Within an exercise context, a social