Sustainable transportation pros, cons, and self-efficacy as predictors of 6-month stage transitions in a Chinese sample

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\textbf{A B S T R A C T}

Sustainable transportation (ST) refers to any form of commuting other than single occupancy vehicle usage. This study prospectively examined the pros, cons, and self-efficacy for ST as predictors of stage transitions over a period of 6 months. Participants included 656 Chinese college students and workers. They completed a translated questionnaire on their ST stage (from Precontemplation to Maintenance), pros, cons, and self-efficacy. Six months later, the participants completed another questionnaire on their stage of change. The data on the participants in the pre-Action and post-Action stages were combined to predict forward transitions out of the pre-Action stages and backward transitions from the post-Action stages. Logistic regression analyses were conducted predicting 6-month stage transitions, either forward or backward, using baseline stage, pros, cons, and self-efficacy. Higher ST pros and, unexpectedly, lower ST self-efficacy predicted forward stage transitions among baseline participants who were not using ST. In contrast, lower ST pros and higher ST cons predicted backward stage transitions (regression) among those who at baseline were using ST. This study provides a preliminary understanding of predictive mechanisms of stage transitions for ST.

1. Introduction

1.1. Background

Climate change is a globally recognized public health problem that negatively affects human health and the environment (Luber et al., 2014). The population-based promotion of sustainable transportation (ST), or commuting to work/school using alternatives other than single occupancy vehicle (SOV) travel, has the potential to alleviate this problem (Redding et al., 2015). ST can include a variety of commuting behaviors, such as using public transport, carpooling, cycling, or walking to work/school (Redding et al., 2015). SOV travel contributes substantially to climate change (Wall et al., 2007); therefore, ST may be a potentially effective target behavior to address this important problem. Despite ST’s potential, SOV travel is dominant, especially in western countries, such as the U.S. (McKenzie and Rapino, 2011). In the case of China (mainland), like other emerging economies, the dominant transport mode has shifted away from being bicycle-dominated to increasingly motorized using SOV (Zegras, 2010). Psychological models that can...
improve the understanding of ST behavior change in established and emerging economies can inform and evaluate population-based ST interventions (Gardner and Abraham, 2008).

Several psychological models and theories have been applied to understand how and why people use ST. For instance, the models include the Theory of Planned Behavior (Ajzen, 1991), the Norm-Activation Model (Schwartz and Howard, 1981), and the Theory of Interpersonal Behavior (Triandis, 1977). These models are non-stage models, and, in most cases, model-based interventions do not divide participants into subgroups. In terms of population-based promotion, it is useful to divide populations into several subgroups, tailoring interventions to the needs of each group (Haustein and Hunecke, 2013). Thus, stage models can be used to formulate stage-matched interventions. In contrast to the models mentioned above, relatively few studies have applied stage models, such as the transtheoretical model (TTM) of intentional health behavior change (Prochaska and DiClemente, 1983), to ST (Bamberg, 2013; Nehme et al., 2016; Redding et al., 2015).

1.2. Literature review

The TTM is the most frequently applied stage model in the health behavior change area (Prochaska et al., 2008). Applied to ST, this model classifies people into the following five ST stages of change: Precontemplation (no intention to initiate regular ST); Contemplation (intention to initiate regular ST within the next six months); Preparation (intention to initiate regular ST within the next 30 days); Action (using ST regularly for less than six months); Maintenance (using ST regularly for six months or longer). People move through the stages, both forward and backward.

The model applied to ST suggests that ST pros, cons, and self-efficacy drive the progression through ST stages (Blissmer et al., 2010; Prochaska et al., 2008). ST pros and cons represent the relative importance of the advantages and disadvantages of ST that are considered for an individual's choice of whether or not to use ST. ST self-efficacy reflects confidence in using ST in challenging conditions. These situations include those in which the user is running late or is tired (Redding et al., 2015). Cross-sectional and longitudinal research has shown that both pros and self-efficacy for health behaviors increase while cons decrease as individuals progress through the stages of change for those behaviors (Blissmer et al., 2010; Hall and Rossi, 2008; Prochaska et al., 2008; Redding et al., 2006). Therefore, it is predicted that higher ST pros, lower cons, and higher self-efficacy will predict forward ST stage transitions and that the opposite will be true for backward transitions. Previous studies (Gatersleben and Appleton, 2007; Redding et al., 2015; Shannon et al., 2006) have reported cross-sectional patterns of stage group differences in reported scores of ST pros, cons, and self-efficacy that are consistent with TTM predictions.

However, no prospective longitudinal study has yet examined ST pros, cons, and self-efficacy as predictors of ST stage transitions. Intervention studies (e.g., Hemmingsson et al., 2009; Mutrie et al., 2002) have been conducted, but such studies have not addressed these issues. Although an increasing number of prospective studies (e.g., Dygrýn et al., 2015; Foley et al., 2015; Merom et al., 2008) have examined ST, especially active commuting, these studies have not measured the stages of change. A recent study by Nehme et al. (2016) measured stages of change for transportation cycling with an interval of 1–2 weeks. However, they did not examine pros, cons, and self-efficacy for transportation cycling. Such a prospective study examining the associations of baseline ST stages, pros, cons, and self-efficacy, and 6-month stage transitions could extend previous cross-sectional findings (Gatersleben and Appleton, 2007; Redding et al., 2015; Shannon et al., 2006). By examining the associations between the baseline ST stages, pros, cons, and self-efficacy and stage transitions over time, evidence of predictive validity can be examined.

This examination is important for the following reasons. First, controversy about the TTM's validity has persisted. For example, Sutton (2000) criticized the definition of each stage in periods because periods such as six months and 30 days were arbitrary. West (2005) argued that the TTM hypotheses about psychological variables, such as pros and cons, and processes causing stage progression were too vague. West (2005) and Adams and White (2005) argued that the TTM's stages do not exist in any meaningful sense as they are proposed. Another important critique of TTM is that the model is not comprehensive (Adams and White, 2005). The TTM focuses on perceived, conscious processes of behavior change and comprises variables open to change (Blissmer et al., 2010). In contrast, the model does not consider other variables such as external (e.g., built environment) and unconscious cues. To address these criticisms and the lack of current research, stronger prospective research is necessary to examine whether or not TTM predictions are supported for ST. This will clarify psychological variables and processes causing stage transitions, as well as test how well the TTM fits the process of initiating and maintaining ST. The focus on variables open to change will limit our comprehensive analyses of ST; however, it is first necessary to examine whether the model's predictions are supported.

1.3. Purpose and hypotheses

This study's purpose was to prospectively examine whether or not baseline ST stages, pros, cons, and self-efficacy were predictors of 6 month ST stage transitions. The following two hypotheses were established and tested: (1) Higher pros, lower cons, and higher self-efficacy will be predictive of forward stage transitions; (2) lower pros, higher cons, and lower self-efficacy will be predictive of backward stage transitions. The unique contribution of this study is its provision of one of the first prospective tests of the TTM applied to ST stage change over 6 months.
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