



Illuminating the unseen in transit use: A framework for examining the effect of attitudes and perceptions on travel behavior



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ABSTRACT

This study develops the Perception–Intention–Adaptation (PIA) framework to examine the role of attitudes, perceptions, and norms in public transportation ridership. The PIA framework is then applied to understand the relative importance of socio-demographic, built environment, transit service, and socio-psychological factors on public transit use for 279 residents of south Los Angeles, California, a predominately low-income, non-white neighborhood. Confirmatory factor analysis based on 21 survey items resulted in six transit-relevant socio-psychological factors which were used in regression models of two measures of transit use: the probability of using transit at least once in the 7-day observation period, and the mean number of daily transit trips. Our analysis indicates that two PIA constructs, attitudes toward public transportation and concerns about personal safety, significantly improved the model fit and were robust predictors of transit use, independent of built environment factors such as near-residence street network connectivity and transit service level. Results indicate the need for combined policy approaches to increasing transit use that not only enhance transit access, but also target attitudes about transit service and perceptions of crime on transit.

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1. Introduction

Understanding the factors that facilitate the use of sustainable travel modes like public transportation has become a major focus of transportation planning over the past few decades. Empirical research in this area has resulted in a large number of studies designed to identify characteristics of the built environment, such as residential density, street design, transit service level, and proximity of employment and shopping, that are associated with transit use. Recent meta-analytical reviews of these studies have concluded that there is convincing evidence of a link between the use of public transportation and characteristics of the built environment, including density, diversity, design, destination accessibility, and distance to transit (Cervero and Kockelman, 1997; Ewing and Cervero, 2001, 2010; van Wee et al., 2002). These built environmental features are the foundation of a number of planning reform movements, including Smart Growth, New Urbanism, Transit Oriented Development, and Active Living by Design (Ewing et al., 2011), whose principles have been adopted by cities around the world.

Though strong evidence exists for a link between the physical environment and travel behavior, a smaller body of research indicates that mode choice and distance traveled have a significant psychological dimension. Studies have shown

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that individuals travel and adapt their travel behavior depending on their perceptions, attitudes, and preferences (Gehlert et al., 2013; Bohte et al., 2009; Fujii and Gärling, 2003). Many of the studies in this area have utilized well proven attitude–behavior theories from social and environmental psychology, such as the theory of reasoned action (TRA, Fishbein and Ajzen, 1975), theory of planned behavior (TPB, Ajzen, 1991), the norm activation model (NAM, Schwartz, 1977; Schwartz and Howard, 1981) and the transtheoretical model (TTM, Prochaska and Velicer, 1997). Research has shown that attitudes toward transit (i.e. Bamberg and Schmidt, 2001; Anable, 2005), norms related to car use and the environment (i.e. Nordlund and Westin, 2013; Haustein et al., 2009; Klöckner and Matthies, 2004), perceived control over travel behavior (i.e. Eriksson and Forward, 2011; Gardner and Abraham, 2007; Haustein and Hunecke, 2007), and concerns about traffic and personal safety (i.e. Elias and Shiftan, 2012; Blainey et al., 2012), all play a role in the decision to use public transportation. In addition, studies of travel behavior change have found that transit use can be facilitated by “soft” measures that are designed to increase knowledge about and positive attitudes toward non-car travel modes (Moser and Bamberg, 2008; Cairns et al., 2008; Fujii et al., 2009). These factors are rarely accounted for in studies of land use and transit ridership patterns.

Though attitude-based studies of transit use provide additional insight into the processes that affect transit use, most have a common shortcoming. Just as studies that focus on the built environment do not typically account for psychological factors, most attitudinal studies do not control for the effect of the built environment. Several researchers have identified the need for a more robust approach to travel behavior research that integrates both approaches and bridges this knowledge gap (Van Acker et al., 2010; Handy, 2005). The few studies that have begun to bridge this gap provide evidence that socio-psychological factors are significant predictors of mode choice and/or distance traveled, even after controlling for neighborhood characteristics (Wang and Chen, 2012; Kitamura et al., 1997; Næss, 2005; Cao et al., 2009a; Bhat and Guo, 2007; Hunecke et al., 2008). However, almost none of the empirical land use – travel behavior studies that attempt to account for spatial, socio-demographic, and socio-psychological aspects of travel have developed a theoretical framework that is tailored to directly measure and account for perceptions and attitudes associated specifically with travel behavior (Van Acker et al., 2010). Exceptions include Van Acker et al. (2011), who examined leisure trip mode choice using a framework that accounted for objective characteristics and individual subjective evaluations of the built environment, lifestyle, and travel. However, no study we are aware of has employed a similar combined framework to empirically examine transit use in daily travel. This lack of a theoretical framework makes systematic evaluation of transit use more difficult and policy directions less clear (Richter et al., 2011).

The current study contributes to the literature on transit use by bringing together spatial, built environmental and cognitive aspects of travel behavior. Specifically, it expands previous research by providing a theoretical framework for understanding how socio-psychological factors interact with built environment characteristics to affect transit use. Building on work on the determinants of transit use (Cervero and Kockelman, 1997), psychological aspects of mode choice (Gehlert et al., 2013), and the role of personal safety concerns on transit (Elias and Shiftan, 2012), the results of this study contribute to the understanding of how complementary “hard” (i.e., infrastructure investments and land use changes) and “soft” (i.e., educational campaigns to encourage behavior change) policy measures can promote the use of public transportation and improve urban sustainability.

The remainder of this article proceeds as follows. First, we present a theoretical framework, which we call the Perception–Intention–Adaptation (PIA) model of travel behavior. The PIA model accounts for the contribution of both built environment and socio-psychological factors, and incorporates an expanded version of the theory of planned behavior (TPB, Ajzen, 1991) to model the attitude–behavior relationship. Second, we test the validity of the socio-psychological constructs in the PIA framework using confirmatory factor analysis (CFA). Third, we specify regression models of transit use that include factors derived from the CFA and variables designed to measure the characteristics of the built environment (Ewing et al., 2011) that have been shown to influence travel behavior. To our knowledge, this is the first study to assess the relative importance of built environmental and transit-relevant socio-psychological factors on transit use specifically.

2. Theoretical framework

The current study employs a theoretical framework designed to examine how attitudes, norms, and perceptions affect transit use. This framework, the Perception–Intention–Adaptation (PIA) model, builds on earlier models of travel behavior adaptation, such as the model conceived by Fried, Havens, and Thall (FHT) (Fried et al., 1977; Havens, 1981), an open system model of travel behavior based on individual adaptive response to imbalances in person–environment fit. In the FHT model, socio-demographic variables such as residential location, lifestyle, and household role patterns are determinants of travel-activity patterns, attitudes, and perceived travel needs. To meet these needs, individuals adapt their behavior based on their perceptions of the urban opportunity structure, financial and time constraints, and household role requirements. Like the FHT model, our PIA model focuses on the role of social and psychological factors in the relationship between the built environment and travel behavior. However, the PIA model moves beyond earlier models by incorporating an expanded version of the theory of planned behavior (TPB, Ajzen, 1991), an empirically tested framework used to understand the relationship between attitudes, behavioral intention, and behavior.

The TPB is an expectancy–value theory that focuses on behavioral intention strength as the prime determinant of behavior (Fishbein and Ajzen, 1975; Ajzen, 1991). It posits that individuals form intentions based not only on their attitude toward the behavior and its outcomes, but also on their perceived ease of performing the behavior and the social pressures they feel

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