



Environmental, behavioral, and psychological predictors of transit ridership: Evidence from a community intervention



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ABSTRACT

Understanding who takes advantage of new transit (public transportation) interventions is important for personal and environmental health. We examine transit ridership for residents living near a new light rail construction as part of “complete street,” pedestrian-friendly improvements. Adult residents ($n = 536$) completed surveys and wore accelerometer and GPS units that tracked ridership before and after new transit service started. Transit riders were more physically active. Those from environments rated as more walkable were likely to be continuing transit riders. Place attachment, but not perceived physical incivilities on the path to transit, was associated with those who continued to ride or became new riders of transit. This effect was mediated through pro-city attitudes, which emphasize how the new service makes residents eager to explore areas around transit. Thus, place attachment, along with physical and health conditions, may be important predictors and promoters of transit use.

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1. Introduction

Environmental psychologists are aware of many reasons to promote public transit use. Public transit use is associated with more physical activity (Rissel, Curac, Greenaway, & Bauman, 2012), lower weight (Brown, Werner, Tribby, Miller, & Smith, 2015), less costly car congestion and pollution (Sallis et al., 2015), and less sprawling development (Xia, Zhang, Crabb, & Shah, 2013), among other benefits (Litman, 2004). However, public transit is less popular than private automobile travel in the U.S., accounting for only 1.3% of trips in many urban areas (for populations 1 to 2.5 million; Santos, McGuckin, Nakamoto, Gray, & Liss, 2011). To get people to use public transit may require transit to have multiple positive features, such as convenience and perceived good quality (Brown, Werner, & Kim, 2003). One major factor prompting use is the physical convenience or accessibility of transit. The current study focuses on residents' patterns of transit ridership after a new light

rail transit line extension was added to their neighborhood as part of a “complete street” improvement. We adopt a socio-ecological or transactional approach that identifies physical environmental, psychological, and behavioral variables related to transit ridership (Altman & Rogoff, 1987; Stokols, 1996).

Complete streets are designed or redesigned to be safe and convenient for use by those without cars, as well as for automotive users (Kingsbury, Lowry, & Dixon, 2011). Worldwide, before the invention of cars, many cities were built in ways that accommodated pedestrian, streetcar, and bicycle traffic. However, in the U.S. and other car-dominated societies, street engineering standards and zoning practices changed to make many streets especially accommodating to higher volumes and speeds of cars. Specific design features, such as wide streets, sweeping turning radii, timed traffic signals, and ample parking requirements encouraged car traffic but discouraged active use by cyclists, transit riders, or pedestrians (Southworth & Ben-Joseph, 1995). As cyclists and pedestrians sought to reverse this trend, the term “complete streets” was coined in 2003 by advocates for streets designed for multiple transportation modes (Dodson et al., 2014). Complete street policies have proliferated quickly in the U.S. (McCann, 2013), albeit with many different operational definitions. For example, the addition of a wide shoulder along a road for pedestrians and cyclists

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might qualify as “complete” in a rural context whereas a more urban context might require crosswalks, separated bike paths, transit stops, or other features intended to support active transportation.

The current study addresses a complete street redesign in Salt Lake City, UT, along North Temple Street, where design formerly emphasized car access. The redesign added a light rail extension to the local system called “TRAX,” narrowed the lanes available to cars from six to four, provided new wider sidewalks, and completed and widened a bike lane. Complete street improvements typically address the transportation corridor only. Yet residents who want to use light rail on the complete street are likely to walk there from home, given the absence of parking at these stations. Thus, residents must perceive the route through the neighborhood from home to the transit stop to be sufficiently attractive for them to take advantage of the complete street community improvement. This study will examine the physical and psychological features that might encourage use of transit along the complete street corridor.

1.1. Physical environmental features and transit use

The design elements that might make an area pedestrian-friendly start with the basic requirements of having enough people and pedestrian-friendly destinations to support walking. Density, whether measured in terms of housing or population, is a frequent correlate of active transportation, such as walking to get to particular places (Agrawal & Schimek, 2007; Cervero & Kockelman, 1997; Glazier et al., 2014; Rodríguez, Evenson, Diez Roux, & Brines, 2009). Similarly, having diverse destinations within walking distance also is associated with walking (Cerin et al., 2013; Cervero & Kockelman, 1997; Glazier et al., 2014; Knuiman et al., 2014; Rodríguez et al., 2009). Although other aspects of the physical environment also support walking, density and diverse walkable destinations were identified in a systematic review to have the most consistent positive relationships with active travel (Saelens & Handy, 2008). Another environmental feature that has been associated with walks to transit stops include relatively short distances, usually less than a kilometer, between home and the transit stop (O’Sullivan & Morrall, 1996), with longer trips to light rail than buses (Daniels & Mulley, 2013). The current study will examine whether living on a walkable block with relatively high residential density and diverse destinations, and living in close proximity to the new complete street are associated with taking advantage of the new transportation options on the complete street.

1.2. Psychological processes and transit use

Past psychological research within the transportation field has often focused on the perceived service characteristics of transit, such as transit riders’ responses to time and financial costs (Handy, Boarnet, Ewing, & Killingsworth, 2002). Research from environmental psychology has broadened the search for psychological predictors of transit use to include perceptions that transit use creates a more likeable city (Brown, Werner, et al., 2003), or supports a better quality of life (Steg & Gifford, 2005), or is avoided because the path to transit looks dangerous or unkmpt (Loukaitou-Sideris, 2006). In this paper we also broaden the search for psychological factors that might encourage transit use by focusing on place attachments to one’s home, block, and neighborhood as well as attitudes toward whether transit makes the city more likeable.

Place attachment is a central concept in environmental psychology that has traditionally been related to how individuals forge positive bonds with particular places, with many studies focusing on the home and neighborhood. Place attachment has been defined in multiple ways but one widely accepted definition is the “positive

affective, cognitive, and behavioral bonding with places and people associated with a setting” (Brown & Perkins, 1992). Affective bonds may be developed when a place provides security, self-esteem, a sense of belonging and other positively charged experiences. The cognitive identification related to place attachment may include familiarity or extending one’s sense of self throughout the home, neighborhood, or other attachment venue. Behavioral aspects of place attachment include use, personalization and upkeep of the place and developing routines of spending time there. Attachment can occur on different geographic levels; one may be attached to one’s car, home, neighborhood, or city, for example. Attachment often involves different social units, such as individuals, families, or community groups. Place attachment is conceptually and empirically distinct from, albeit related to, other neighborhood constructs such as social capital and perceived security (Dallago et al., 2009).

Place attachment is increasingly found to be related to behavioral outcomes that matter beyond the individual’s positive affective bonds with and attitudes toward a place. Place attachment has been associated with various pro-environmental behaviors that benefit society, such as intentions to plant native vegetation (Raymond, Brown, & Robinson, 2011); self-reported engagement in understanding climate change (Scannell & Gifford, 2013); and reports of pro-environmental activities (Scannell & Gifford, 2010; Zhang, Zhang, Zhang, & Cheng, 2014). Similarly, place attachment can be related to more involvement in the area, such as more reported place attachment among local business owners catering to tourists in natural areas (Bonaiuto, Carrus, Martorella, & Bonnes, 2002) or greater place attachments among residents with more social ties (Mesch & Manor, 1998). In a series of studies of a redeveloping neighborhood, residents of new housing in an otherwise deteriorating neighborhood reported experiencing strong attachments to and confidence in the neighborhood (Brown, Brown, & Perkins, 2004). But beyond these personal feelings, place attachment was correlated with a reduction in police reports of crime for homes near the new neighborhood (Brown, Perkins, & Brown, 2004b) and an increase in nearby housing improvements by home owners (Perkins, Larsen, & Brown, 2009). In the larger neighborhood, living on a block where neighbors had stronger place attachments also related to less vulnerability to crime incidents at those homes (Brown, Perkins, & Brown, 2004a).

However, there is also evidence of negative aspects to place attachment. For example, in the neighborhood redevelopment research above, after the new homes were built, the nearby long-term residents reported an erosion of pride in one’s home (a component of place attachment). Perhaps the longer term residents reacted negatively to the contrast in the conditions between the new and older housing conditions (Perkins et al., 2009). Other negative consequences of place attachment include increasing one’s risk by remaining in a war zone in part because of attachment to home (Billig, 2006) or opposing sustainable energy developments because they threaten place attachments (Devine-Wright & Howes, 2010). Thus, past research demonstrates that individuals’ place attachments often, but do not always, foster beneficial personal, community, and/or environmental outcomes as well.

When considering whether place attachment might help residents and the community benefit from new transit investments in their neighborhood, the actions of place attachment beyond the home must be considered. Attachment to the home and neighborhood might motivate one to explore and experience the neighborhood more. Lewicka identified this form of attachment as “place discovered,” such as when residents take an interest in changes in their neighborhood, seek out new neighborhood destinations, and are motivated to show guests around their community (Lewicka, 2013). This forward-looking aspect of place attachment may explain how those who are attached to their

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