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Examining the relationships between perceived neighborhood mobility characteristics, perceived incivilities, travel attitudes, and physical activity amongst university faculty and staff

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ABSTRACT

This paper discusses the results of a pilot study that used a structural equation modeling approach (SEM) to examine whether self-reported physical activity levels can be explained as a function of participants' perceived neighborhood mobility characteristics, perceived neighborhood incivilities (i.e. social and physical conditions in a neighborhood that are viewed as troublesome and potentially threatening by residents and users of public spaces), and travel attitudes. Data was collected by survey from ninety-four faculty and staff working at universities in three cities. The study results indicated that travel attitudes explain about seven percent of the variance in physical activity. More importantly, they indicated that the majority of the variance in perceived neighborhood mobility—that is, the degree to which the built environment is perceived to support physical activity, including active commuting—can be explained by perceived incivilities and travel attitudes alone. This finding is significant because it suggests that simply increasing mobility options may not be sufficient to get people to engage in more physical activity, since peoples' perceptions of their mobility options are influenced by more than just the real availability of options in the built environment. A larger follow-up study is needed to verify these findings. Nonetheless, planners and policy makers may want to rethink how they approach encouraging people to engage in physical activity, since the built environment may not be as significant as the perceptual one.
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1. Introduction

This paper reports the results of a pilot study that builds upon the work of Terzano and Morckel (2011) and Kaczynski and Glover (2012) by examining whether self-reported physical activity levels can be explained as a function of one or more of three factors: neighborhood mobility characteristics, perceived neighborhood incivilities, and travel attitudes.

According to the social ecological model of health behavior, a person's willingness and ability to engage in healthful behaviors may be influenced by a number of variables existing at different levels, including the individual, interpersonal, organizational, and environmental levels (Schneider, 2011). Thus, different variables at any one or more of these levels may influence a particular population's tendency to be physically active. Terzano and Morckel (2011) found that people who walk or bike as part of their commute also exercise more outside of the commute compared to people who commute by mass transit or car. But before embracing active commuting as a way to increase population-level physical activity, it is important to examine the various factors that may have contributed to this finding. Previous literature suggests that three factors influence a given population's physical activity in particular—neighborhood mobility characteristics, travel attitudes, and perceived neighborhood incivilities (explained below).

A number of studies have demonstrated a relationship between the built environment and physical activity. The majority have examined whether physical activity is influenced by one or more of the five D's of development: density, diversity, design, destination accessibility, and distance to transit (Ewing et al., 2011). As Terzano and Morckel (2011) were primarily interested in the effects of commute mode choice, they focused on neighborhood characteristics that support mobility, including destination accessibility (i.e. whether residents can easily access major destinations, such as downtown or a shopping mall) and multi-modality (i.e. the ability to

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commute by means other than personal vehicle). This paper will do likewise and refers to these variables as "neighborhood mobility characteristics."

Travel attitudes are particularly important to consider when examining physical activity that is part of the commute to work. Travel attitudes include preferences for walking, biking, using public transit, or driving a personal vehicle. People who have positive views about walking or biking may self-select into neighborhoods conducive to active forms of commuting (Cao et al., 2007). Travel attitudes may affect mode choice in that people are most likely to consider their desired commute mode when deciding where to live; that is, they do not decide where to live and *then* consider their various commute mode choices (Pinjari et al., 2007). With respect to Terzano and Morckel's finding that active commuting is linked to increased recreational physical activity, perhaps active commuting does not encourage recreational physical activity. Rather, people who enjoy exercising or are physically active in general may choose to live in neighborhoods that support both active commuting and active recreation. Thus, choice of residential location is potentially an endogenous variable, as factors such as travel behavior and travel attitudes may determine residential location. Terzano and Morckel's (2011) study may have benefitted from the inclusion of attitudinal variables as a way to control for this type of self-selection bias.

Perceived neighborhood incivilities have also been associated with lower physical activity levels (Ellaway et al., 2005; Carnegie et al., 2002; Ross, 2000). Perceived incivilities refer to social and physical conditions in a neighborhood that are viewed as troublesome and potentially threatening by its residents and users of its public spaces (Taylor, 2003). Indicators of incivilities may include vacant or abandoned structures, lack of maintenance, or crime (Nasar, 2015). If residents believe that their neighborhood is a dangerous or otherwise undesirable place, they may withdraw from public spaces and minimize time spent outdoors (Foster and Giles-Corti, 2008), which would subsequently minimize the time spent actively commuting. The notion that people avoid places with indicators of incivilities is supported by the literature on "cues to care" (Nassauer and Raskin, 2014) and the "broken windows theory" (Wilson and Kelling, 1982).

Finally, the current study's approach reflects the work of Kaczynski and Glover (2012) by considering joint effects—that is, how the effects of two or more variables compound or interact to impact physical activity. Kaczynski and Glover note, "Numerous studies have examined the relative influence of a variety of PA [physical activity] correlates, yet few studies have explored the compounding effects of enhancing factors at different levels of the social ecological model" (p. 382). They examined differences in reported physical activity levels amongst four groups that varied in perceptions of their neighborhoods' physical and social environments. Participants who perceived their neighborhood to have both high walkability and social connectedness reported the highest levels of physical activity. This finding supports the use of joint effects in the current study and suggests that active commuters who reported high levels of physical activity outside of their commutes (Terzano and Morckel, 2011) may have been responding to environmental factors rather than to a direct effect of their active commuting on physical activity outside of the commute.

The current study expands upon Kaczynski and Glover's 2012 study in three important ways. First, it takes a more comprehensive view of the built environment by including multiple indicators of mobility and destination accessibility. (Kaczynski and Glover only considered walkability). Second, it takes a different approach to measuring the social environment. Kaczynski and Glover defined the social environment in terms of perceived social connectedness and social capital; whereas, the current study focuses on indicators of incivilities. This approach is based on a literature review by Wood and Giles-Corti (2008), who found linkages between social capital and neighborhood incivilities, disorder, and esthetic appearance (among other variables). Third, the current study includes participants' attitudes about active commuting, a variable that was not considered by either Kaczynski and Glover (2012) or Terzano and Morckel (2011). In both of these previous studies, the results may have been influenced by self-selection bias, whereby people with positive attitudes about walking and biking engage in these activities both during and outside of their commutes.

With these considerations in mind, this study uses a structural equation modeling (SEM) approach to attempt to explain total reported physical activity as a function of neighborhood mobility characteristics, perceived incivilities, and travel attitudes. While prior studies examined these factors separately, no study has examined all three factors simultaneously. A structural equation modeling (SEM) approach was selected because there are multiple measures for these factors, multiple dependent variables, and the possibility of indirect effects. Unlike traditional linear regression models, SEM can model relationships between multiple dependent variables as well as model indirect effects (Tabachnick and Fidell, 2007; Schumacker and Lomax, 2004).

2. Methods

2.1. Structural equation modeling

SEM uses a combination of factor analysis and multiple regression analysis; the objective is to create a model that produces an estimated population covariance matrix that is not significantly different from the sample covariance matrix. Models are assessed using chi-square (χ^2) test statistics and multiple model fit indices (Tabachnick and Fidell, 2007). Latent variables (factors or constructs that are difficult to measure directly) are first determined in a *measurement model* that relates directly measured variables to individual latent variables. A *structural model* then tests the hypothesized relationships amongst the latent variables. To visualize relationships, SEM makes use of path diagrams that typically represent latent variables with ovals, directly measured variables with rectangles, and relationships between variables with various types of lines. Lines with two arrows indicate covariation, while lines with one arrow indicate a directional relationship with the arrow pointing towards the dependent variable. SEM was conducted using LISREL software version 8 (Scientific Software International, Inc.).

2.2. Participants

Participants were randomly selected from directories of faculty and staff at colleges and universities in three U.S. cities in fall of 2010. 35 participants were from Youngstown, Ohio; 36 from Columbus, Ohio; and 28 from Washington, D.C. As this was a pilot study, the sample size was relatively small, yet it was found to be adequate. In SEM, sample size is considered adequate if the model has sufficient power to appropriately detect statistically significant relationships between variables (MacCallum et al., 1996). Here, power was sufficient at 8380, as indicated by post hoc power analyses using G*Power 3.1.2 software. A total of 99 participants (50 female, 41 male, 8 not indicating

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