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Does improving the physical street environment create satisfactory and active streets? Evidence from Seoul's Design Street Project

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ABSTRACT

As the overall interest regarding pedestrian-friendly environments grows, street-improvement projects are continually implemented. These projects aim to encourage walking activities and promote street-based social activities through the improvement of pedestrian environments; however, only a few studies have empirically evaluated the impact of street improvement on pedestrian satisfaction and pedestrian volume. The present research study examines the influence of the Design Street Project of Seoul, Korea, for which sidewalks, public spaces, and the other physical elements of streets were improved. For a difference-in-difference analysis, the pedestrian-satisfaction levels and the pedestrian volumes of the Design Streets and the matching areas from before and after the implementation of the Design Street Project are compared. Multilevel models indicate that the improvement of the street environment positively influences pedestrian-satisfaction levels, but is not effective for increasing the pedestrian volume. The results imply that the physical improvement of street environments can be effective for the elevation of pedestrian-satisfaction levels, as well as quality of life.

1. Introduction

Many researchers and planners argue that a low-carbon and low-energy city can be achieved by encouraging walking as a sustainable transportation option and by promoting healthy physical activity (e.g., Haines et al., 2010; Pucher and Buehler, 2010; Soltani and Hoseini, 2014). Walking is thus presented as a viable alternative to the use of private vehicles that produce harmful emissions. Urban planning approaches such as transit-oriented development and new urbanism focus on the promotion of walking with the aim of reducing air pollution and energy consumption (Calthorpe, 1993). Thus, streetscape qualities that encourage walking have emerged as an important factor in urban and transportation planning (Ha et al., 2011).

Streets are symbolic, ceremonial, social, and political urban spaces, with capacities beyond the spatial functions of access and movement (Jacobs, 1993:4). Key urban theorists and researchers such as Jane Jacobs, William Whyte, and Donald Appleyard have opposed the modernist perspective that regards walking space as merely an organ of an urban-transportation

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system and argued that walking should recover its multi-dimensional functions. Streets, as places and social activity, should be equipped with adequate spatial structures and qualities for comfortable and pleasant walking (Whyte, 1988:56). When a street is "markedly superior in character or quality," it can be considered a "great street" (Jacobs, 1993:2). Empirical studies also found that micro-scale streetscape features such as crowdedness, air quality, the presence of trees, and pavement condition are related to pedestrian satisfaction and activity levels (e.g., Ewing and Clemente, 2013; Kim et al., 2014; Park et al., 2013; Stradling et al., 2007). A variety of projects have thus been undertaken for the construction and improvement of walking environments.

The City of Seoul considers walking to be an important element in urban-space and social-culture policies. Initiated in 2007 by the former mayor of Seoul, Se-hoon Oh, the Design Street Project is leading an urban-policy project called "Design Seoul" that seeks to make Seoul a "Clean and Attractive Global City." The aim of Design Seoul is to create a "pleasant Seoul urban life environment" through four basic strategies: "clearing," "integration," "cooperation," and "sustainability," whereby the focus is the improvement of public design and the cityscape. In considering the impression of disorganization projected by existing streets—a result of the separate construction of street elements for their respective functions—the project attempted to create an integrated design. The Seoul Metropolitan Government subsequently initiated three periods of the Design Street Project in 30 target areas from 2007 with the aim of creating pedestrian-friendly streets.

While a few studies have assessed street-environment improvement projects such as the Design Street Project, empirical studies regarding the actual post-completion influence of such projects are still insufficient. This study therefore comprises an analysis of how design integration, repairing a dispersed public-street facility, and improving signage and other façade design elements on neighboring buildings influence quality of life in the corresponding urban area.

Moreover, most walkability studies primarily focus on travelers' walking choices based on the satisfaction (utility) that can be observed from their chosen mode, treating travel as an instrument to meet travelers' mobility needs (McFadden, 2001). However, pedestrian satisfaction can also be understood as the degree of subjective well-being that pedestrians experience during travel (Axhausen and Garling, 1992; Friman et al., 2013). From this perspective, travel is regarded as an objective in itself, which can improve quality of life. Hence, the present study aims to investigate pedestrians' mode choice and experience by assessing the influence of physical street improvement on pedestrian volume and satisfaction.

To achieve this objective, we undertook difference-in-difference analyses of unique, repeated cross-sectional survey data from pedestrians in Seoul. We attempted to examine the Design Street Project's effect on pedestrian satisfaction and the volume of actual pedestrians, recorded before and after Design Street Project completion. Through a series of analyses, our ultimate goal is to attain insight into effective street strategies for achieving walkable environments that improve the quality of life of Seoul's citizens.

This paper is structured as follows: Section 2 discusses theoretical and empirical studies on the relationship between built environments and pedestrian satisfaction and volume; Section 3 introduces the present study's context, survey data, and methods; Section 4 presents the results of our pedestrian satisfaction and volume models; and the paper culminates with a discussion of the implications and limitations of the present study and suggestions for future research directions.

2. Theoretical and empirical background

2.1. Satisfaction and the built environment

In the field of urban planning, satisfaction regarding environmental quality has been primarily studied in the context of residential environments. Most relevant empirical studies have therefore investigated residential satisfaction in relation to residents' characteristics, attributes of physical environments, and social aspects of living environments. Amerigo and Aragones (1997) defined residential satisfaction as a "positive affective" psychological state experienced by individual residents living in residential environments; within their framework, the level of residential satisfaction is influenced by objective and subjective environmental attributes and the residents' characteristics (Amerigo and Aragones, 1997).

In the field of transportation, utility theory explains the ways that individual travelers choose activities, destinations, and travel modes based on the satisfaction levels (utility) that they derive from observed choices (McFadden, 2001); however, derived utility-based satisfaction can significantly differ from actual experience because travelers are likely to underestimate the intensity of their experiences (Ettema et al., 2010; Wilson and Gilbert, 2003). An alternative concept of experienced utility is the satisfaction derived from the outcomes of travelers' choices (Kahneman et al., 1997). Abou-Zeid and Ben-Akiva (2011), Abou-Zeid et al. (2012) developed tools that measure experienced utility in order to incorporate travelers' satisfaction levels (or "happiness") into a discrete-choice modeling framework.

Friman et al. (2013) treated satisfaction regarding travel as domain-specific subjective well-being that includes cognitive and affective components. In their view, traveler satisfaction is the degree to which a transport system provides a service that fulfills travelers' needs. In travel-behavior research, travel is regarded as an instrument that enables participation in activities in different places rather than as an objective in itself (Axhausen and Garling, 1992). An assessment of the level of need fulfillment generally depends on travelers' self-reported judgements of a transport system that take into account cost, travel time, and punctuality (Eriksson et al., 2008; Fellesson and Friman, 2008); however, Stradling et al. (2007) further identified non-instrumental factors such as cleanliness, privacy, safety, convenience, and scenery that influence traveler satisfaction with a bus service.