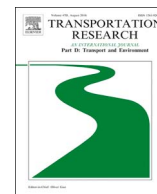




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Walk score® and its potential contribution to the study of active transport and walkability: A critical and systematic review

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ABSTRACT

The Walk Score® index has become increasingly applied in studies of walking and walkability. The index assesses the “walking potential” of a place through a combination of three elements: the shortest distance to a group of preselected destinations, the block length, and the intersection density around the origin. The Index links a gravity-based measure (distance accessibility), with topological accessibility (street connectivity) measured by two complementary indicators that act as penalties in the final score (linearly expanded in the range 0–100). A systematic review of Scopus® and Web of Science® was conducted with 42 journal articles eventually being evaluated. Research was primarily undertaken in North American urban geographies. Analysis of walkability using Walk Score® is inconsistent. Twenty-nine papers do not exclusively relying on Walk Score® as a single measurement of walkability and add further estimates to better capture the multiple dimensions of walkability. In 33 studies the Walk Score® was used as an independent variable, and only once as a mediating-moderating variable. In eight papers (18%) the Walk Score® was a part of a bivariate correlation model. On no occasion was it used as a dependent variable. Results tend to only partly support the validity of Walk Score®. The paper concludes that the Index is best understood as a surrogate measure of the density of the built environment of a specific neighborhood that indicates utilitarian walking potential. Implications for, and potential areas of, future research are discussed.

1. Introduction

A September 2017 feature article in *The Guardian* asked “Where’s is the world’s most walkable city?” (Laker, 2017). The article attracted more than 2200 shares and 500 comments in less than 48 hours and highlights the increased concerns of planners, researchers and the wide public over walking (Alvanides, 2014). Walking and walkability, the capacity to walk at a location, are a significant focus for improving the quality of the built environment (Hall et al., 2018). Identified benefits of increased walking for transport and leisure include not only reductions in traffic congestion, air pollution, and emissions (Talen and Koschinsky, 2013; Forsyth, 2015), but also improvements in public and private health (Doyle et al., 2006; Durand et al., 2011), community relations and positive sense of place (Leyden, 2003), and improvements in economic and real estate performance (Leinberger and Alfonzo, 2012; Trowbridge et al., 2014). As a form of transport, walking therefore has the potential to contribute simultaneously to all three pillars of

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sustainability (economy, society, the environment).

Walkability can be broadly defined as the extent to which an environment, usually the built environment, enables walking (Kelly et al., 2011) and is pedestrian friendly (Gebel et al., 2009; Moura et al., 2017). However, the notion of ‘walkable’ is multi-dimensional (Forsyth and Southworth, 2008), with studies emphasising different environmental features or means of developing walkable environments, including areas being traversable, compact, physically enticing and safe, while others deal with the outcomes potentially fostered by such environments, such as making places lively, enhancing sustainable transportation options, and encouraging outdoor exercise and leisure (Forsyth, 2015; Saelens and Handy, 2008; Hall and Ram, 2018).

In order to assist in improving the quantity and quality of walkability, two main research approaches have been adopted. First, a substantial effort has been given to developing walkability measures (Ewing and Handy, 2009; Gebel et al., 2009; Hoedl et al., 2010; Iacono et al., 2010; Lwin and Murayama, 2011; Horacek et al., 2012; Vale et al., 2016). These include qualitative and quantitative measures of the built, external and social environment (Southworth, 2005; Lo, 2009; Riggs, 2015); trip purpose (Forsyth et al., 2008); as well as the gender and cultural context within which walking occurs (Forsyth, 2015; Hall et al. 2017). A second minor stream is the provision of reviews that aim to synthesise knowledge regarding the walkability concept. However, this task faces many challenges, since the notion is shared by different disciplines each with their own framing of the concept. Hajna et al. (2015a) quantitatively analysed six papers, finding that walkable neighbourhoods enhance 766 more steps per trip than less walkable neighbourhoods. Other studies have adopted qualitative practices. On the basis of a review of 77 papers, Rothman et al. (2012) argued that the majority of built environment features had inconsistent associations with either walking or injury of children (4–12), or had not been tested for either one of the outcomes. Grasser et al. (2013) focused on adults and qualitatively concluded weak correlations of walkability with physical activity for transport and weight-related outcomes on the basis of a sample of 34 papers. The purpose of the current work is to elaborate further the analysis of walkability, providing a novel analysis that combines the two practices, and offering an overview of research that has used a specific walkability measure, Walk Score®, which is also available for use by the general public.

1.1. The Walk Score® index

A method that is being increasingly adopted in the analysis of walkability is that of the Walk Score® index. Walk Score® is a company that uses a patented system to offer a range of walkability, planning, health, transport, and real estate data. In addition to the walkability measure of Walk Score® they also offer measures of Transit Score (a measure of transit accessibility), bike score (bike accessibility), opportunity score (measures ease of accessibility to nearby jobs without a car adjusted for population), pedestrian friendliness, public transit data, score details for particular walking destination locations, and travel time analysis.

Walk Score's mission is to promote walkable neighbourhoods. The Walk Score® index is part of a suite of products designed “to make it easy for people to evaluate walkability and transportation” (walkScore.com). Walk Score® methodology combines three elements: the shortest distance to a group of preselected destinations (such as commerce/services, e.g. public transport, restaurants, shopping, parks/green spaces, and schools), the block length, and the intersection density around the origin. Data sources include Google, Education.com, Open Street Map, the U.S. Census, and users (Walk Score® 2017). Walk Score® links a gravity-based measure (distance accessibility), with topological accessibility (street connectivity) measured by two complementary indicators that act as penalties in the final score (linearly expanded in the range 0–100) (Vale et al., 2016). Prior to 2010 the Walk Score® algorithm used a one mile Euclidean distance buffer (Carr et al., 2010) but currently the buffer is determined by the network (Manaugh and El-Geneidy, 2012; Hirsch et al., 2013; Vale et al., 2016).

The company states on its web site that Walk Score® data is available in the United States, Canada, Australia, and New Zealand, although the web site can be used to produce walk score rankings for locations in other countries. Walk Score® was purchased by a real estate agency, Redfin, to provide an additional service to the customers of the two companies by providing a business synergy. The missions of the two companies were merged to “encourage people to make sustainable choices about where to live” (Kelman, 2014). It should therefore not be surprising that research on housing as a dependent variable is also increasingly conducted using Walk Score® (Kim and Woo, 2016; Li et al., 2014, 2015; Pivo and Fisher, 2011; Renne et al., 2016).

Walk Score® has been used in a number of studies on walkability, particularly for purposes of health and physical activity research (Vale et al., 2016), with a number of studies concluding that it provides a valid means of assessing neighborhood accessibility for walking (e.g. Duncan et al., 2011, Duncan et al., 2013, Duncan et al., 2016). The method is also regarded as attractive because it provides a convenient and inexpensive research option for exploring the relationship between access to walkable amenities and physical activity (Carr et al., 2010, 2011). Therefore, perhaps not surprisingly, use and acceptance of Walk Score® as a means to assess walkability has increased over time (Vale et al., 2016). Although several reviews have been conducted on assessments of walkability (e.g. Southworth, 2005; Moudon et al., 2006; Ewing and Handy, 2009; Lo, 2009; Talen and Koschinsky, 2013; Forsyth, 2015; Vale et al., 2016; Ram and Hall, 2018), no review has yet been conducted specifically on the use of Walk Score®. Therefore, based on a systematic review of the academic literature found in the Scopus and Web of Science databases this paper aims to answer the following questions: (1) what are the findings of Walk Score® studies; (2) do different uses of Walk Score® generate different results?; and (3) what should be the priorities for future Walk Score® research?

2. Method

In January 2017 a systematic search was conducted of the Web of Science® and Scopus® bibliometric databases using the occurrence of the terms “Walk Score” or “walkscore” in the title, abstract or keywords of publications. Eighty-six publications were

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