Chapter 10
Promoting Walking via Ease of Wayfinding

Chanam Lee

10.1 Introduction

Walking is a locomotive activity that requires moving from one location to another location. Walkability refers to the qualities of an environment, both objective and perceived, that can influence walking (Vandenberg et al. 2016). Both of these concepts are closely linked to the ability to find our way and navigate through the environment.

Walking is an important health and travel behavior that, unfortunately, has become less popular over the years. Among the many factors behind this decreased popularity are the auto-centric community environments that discourage walking. Walkable communities (i.e., those that facilitate walking) are gaining increasing acceptance as a way to promote walking, and studies have identified various built environmental factors associated with walking. However, factors related to community wayfinding have not been fully investigated as components of walkable communities.

In this chapter, I first describe the importance of walking and the potential roles of wayfinding in promoting walking, and I identify the conceptual links among walking, community environments, and wayfinding. I then discuss the policy and practice implications and guiding principles to promote walking via ease of wayfinding. My hope is that this chapter will bring increased attention to wayfinding as an important agenda item to be added to the current discussions on walkable communities and as an integral element of a walkable community that requires further attention by researchers, practitioners, policy makers, and the general public.

C. Lee, Ph.D., MLA (✉)
Texas A&M University, College Station, TX, USA
e-mail: chanam@tamu.edu

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10.2 Walking and Community Environments

Walking is the most common leisure-time physical activity reported among adults (Lee and Moudon 2004). It has been linked to many health benefits, including cardiovascular fitness and healthy weight (Sallis et al. 2009); prevention and management of diabetes, depression, and mental health (Gregg et al. 2003; Roe and Aspinall 2011; Robertson et al. 2012); and cognitive functioning (Renalds et al. 2010). Walking has been shown to be influenced by or associated with numerous factors, including personal (e.g., age, gender, race, self-efficacy, attitude), interpersonal (e.g., having someone to walk with, seeing others walking in the neighborhood), built environmental (e.g., destinations, streets/sidewalks) and natural environmental (e.g., parks, open spaces/greenery, slope/terrain) factors (Sallis et al. 2006, 2008; Saelens and Handy 2008; Agrawal and Schimek 2007). Environmental factors are increasingly considered as intervention targets because environmental improvements (e.g., new sidewalks), once implemented, become permanent features of the community, facilitating long-term, sustained behavior changes among many members of the community. The following summarizes findings from selected studies on the relationships between environmental factors and walking behavior.

Most existing studies on community environment–walking relationships are cross-sectional, testing only the correlational associations between the two. Those correlational studies reveal a number of environmental factors associated with walking, which include connected streets, medium-to-high density, mixed land uses, availability of sidewalks, availability of and proximity to utilitarian (e.g., retail and service) and recreational destinations, traffic and crime safety, visual quality or views/scenery, and slope (Saelens and Handy 2008; Sugiyama et al. 2012; Yen et al. 2009).

While the associations between these environmental factors and walking tend to be similar across different *population groups*, interesting differences have also been reported. Such walkability features as mixed land uses, development density, and street connectivity—generally shown to be positively associated with walking among the general adult population—have been reported insignificant or negative for children and older adults (Zhu and Lee 2008; Nagel et al. 2008; Shigematsu et al. 2009). The relative importance of certain factors, such as neighborhood safety, has also been shown to vary across different population groups, with higher importance of crime-related safety reported by women, minorities, and lower-income groups and traffic-related safety concerns more commonly reported by male and higher-income groups as barriers to walking (Zhu and Lee 2008; Van Cauwenberg et al. 2011). As another aspect of safety, Li and colleagues studied the risk of outdoor falls among older adults and found that residents in neighborhoods with low socioeconomic status were more likely to experience falls—probably because they also walked more for utilitarian purposes. They further found a high risk of being injured when falls occured on sidewalks/streets compared with recreational areas (Li et al. 2014).

Purposes of walking—that is, walking for recreation or exercise versus utilitarian walking (e.g., to get to/from a store, school, or work)—have also been shown to be associated with different environmental factors. Accessibility to daily destinations (e.g., proximity to restaurants, grocery stores) appears most important for utilitarian walking, while the quality of route seems more important for recreational walking (e.g., availability of sidewalks, safety, nice views) (Lee and Moudon 2006; Gauvin et al. 2008; Owen et al. 2004). Sugiyama et al. (2012) reviewed 46 quantitative studies examining factors related to adults' walking. They found the frequency of utilitarian walking to be positively associated with the number of retail/service destinations, sidewalk availability, and street connectivity. Factors such as recreational destinations (presence, proximity, and quality) and route aesthetics (e.g., attractive buildings/sceneries) were positively related to recreational walking but inconsistently related to utilitarian walking. The authors also pointed out that a major gap in our understanding of community environment–walking relationships was the dearth of studies conducted outside of Western countries or in rural areas or small towns (Saelens and Handy 2008; Sugiyama et al. 2012).

That point leads to another important contextual consideration: the *community setting* or *context*. Most previous studies have been conducted in urban or metropolitan areas, and little is known about the walkability of rural communities. Compared with urban residents, rural residents tend to be less active and walk less, especially for utilitarian purposes, and their walking behaviors may be less strongly related to environmental attributes (Doescher et al. 2014; Parks et al. 2003). Researchers suggest that targeting recreational walking and improvement of recreational amenities such as trails may be more feasible in rural communities (Brownson et al. 2000; Doescher et al. 2014). Empirical knowledge is incomplete regarding the setting/context-specific correlates and determinants of walking, especially for rural communities.

Compared with the large body of correlational studies, a relatively small number of intervention studies can be found. This shortage is due to the methodological challenges in and limited resources available for longitudinal population studies, which tend to come with numerous constraints and confounders. Feasible intervention studies are often limited to those involving naturally occurring interventions (e.g., individual residential relocations, new sidewalk or park installations). However, designing a research study, securing the necessary funding and resources, and recruiting the participants in a timely manner to properly carry out both the pre-intervention and the post-intervention assessments are still quite difficult. The process can become even more challenging if both case and control participants are included in the study for more rigorous analyses. However, a small number of recent studies have begun to investigate causal relationships by examining the impact of environmental changes on walking behavior. For example, a study by Hirsch et al. showed that moving to a more walkable neighborhood [i.e., with a higher Street Smart Walk Score—see (Walk Score 2015a)] resulted in increased minutes of walking (Hirsch et al. 2014). Another case-comparison study by

Gustat and colleagues examining the impact of new walking path construction demonstrated that the physical activity levels of those who lived near the newly constructed walking paths increased significantly more than those in the comparison neighborhoods (Gustat et al. 2012).

10.3 Benefits of Walkable Communities

What constitutes a walkable community environment can vary by many factors as previously discussed. Regardless of those differences, environments considered walkable have been shown to bring an array of health, environmental, and economic benefits through various mechanisms. For example, they foster active lifestyles by encouraging walking and other routine exercise and recreational physical activities (Sallis and Glanz 2009; Kerr et al. 2012; Trowbridge and Schmid 2013; King et al. 2011). Walkable communities can also bring psychosocial health benefits by increasing opportunities for formal and informal social interactions with neighbors and by promoting a sense of belonging and community attachment (Zhu et al. 2014; Leyden 2003; Lund 2003). Their socially supportive environments are also linked to increased life satisfaction, sense of well-being, and perceived overall health (Badland et al. 2014; Hernandez et al. 2015). For certain groups of people such as older adults, people with physical or cognitive impairments, or those living with limited resources, walkable environments can be even more important because such environments can help increase mobility, independence, and social ties (Nathan et al. 2012; Shimura et al. 2012; Balfour and Kaplan 2002).

Benefits of creating walkable communities encompass environmental dimensions, especially if walking can replace some of the existing automobile trips. Reduced reliance on automobiles can reduce emission-related air pollution and cut down the use of land for parking and roadways. In addition, high rates of foot traffic have been shown to bring economic benefits through increased retail sales for certain businesses and increased property values (Perdikaki et al. 2012; Nwogugu 2006). However, it is also important to recognize the potential harms of exposure to air pollution, especially those emission-related pollutants (e.g., nitric oxide, particulate matter) that tend to be concentrated along streets. A study by Marshall and colleagues conducted in a large Canadian city showed that high walkability areas tend to have high pollution levels. Only 2 % of the total zip code areas had high walkability and low pollution levels, and those desirable areas were almost always located in high-income neighborhoods, near—but not in—the city center (Marshall et al. 2009). A World Health Organization report states that fine particulate matter generated by vehicles and industries accounts for about 8 % of lung cancer deaths and 5 % of cardiopulmonary deaths worldwide (World Health Organization 2009).

Understanding the economic values of walkable environments is an important prerequisite to help facilitate policy and environmental interventions. However, only a small body of research so far has investigated this issue. One study (Li et al. 2015) examined the degree to which communities are rated as walkable. One measure

of walkability this study used was the existence of sidewalks in a neighborhood. The other was the Street Smart Walk Score (Walk Score 2015b) with values ranging from 0 to 100 representing the lowest to the highest levels of walkability, based on street connectivity and accessibility to popular destinations such as stores, restaurants, and parks. The authors reported that higher walkability ratings added significant premiums to single-family-property sales prices in communities that scored 50 or higher (considered at least "somewhat walkable") but not in communities that scored lower than 50 (considered "car-dependent"). Another economic analysis study carried out in Washington, D.C. reported that walkable environmental features increased residential sales values and office/retail/residential rental values (Leinberger and Alfonzo 2012). This study also showed that residents in more walkable neighborhoods spent a smaller proportion of their household income on transportation compared with those living in less walkable neighborhoods. A Seattle study by Sohn et al. (2012) also found evidence supporting positive relationships between property values and walkability features such as development density, mixed land uses, and pedestrian infrastructure.

Other long-term benefits of walkable environments include additional economic benefits such as increased investment, visitors, and tourism spending (Litman 2003). More economic and cost-benefit studies that probe into both the short-term and long-term benefits of walkability can facilitate policy changes and public support for promoting walkable and legible communities. Empirical knowledge about factors contributing to increased walking is not complete. Major knowledge gaps include causal mechanisms, mediating and moderating factors, and the relative importance of various contributing factors. Further, the costs/harms associated with walking or walkable environments also need to be more thoroughly examined to gauge the full range of potential benefits and costs.

10.4 Walkability and Wayfinding

10.4.1 Linking Walkability with Wayfinding: Behavioral Model of Environment

The behavioral model of environment (BME) offers a useful framework to conceptualize community environmental factors important for walking (Lee and Moudon 2004; Moudon and Lee 2003), which can also be used to derive relevant implications for pedestrian wayfinding. BME organizes elements/features of walkable communities into three components: origin-destination, route, and area (Fig. 10.1).

Origin-Destination This element refers to the points where a pedestrian starts and ends his/her trip. In the case of transportation walking, origins and destinations are two separate locations (Fig. 10.1a); for leisure-time or exercise walking, the origin and destination locations are typically the same (Fig. 10.1b). In wayfinding, pedestrians need to know where they are now (origin) and where they are going (destination).

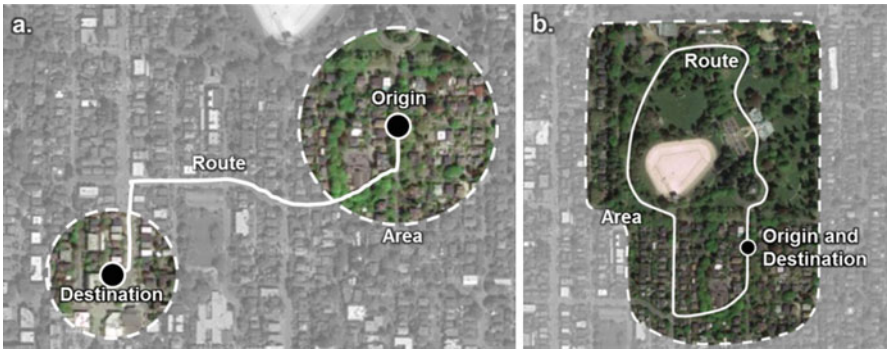

Fig. 10.1 Behavioral model of environment for (**a**) transportation and (**b**) recreational walking trips

Walkable destinations are sometimes different from automobile-oriented destinations. They (e.g., restaurants, cafes, grocery stores, neighborhood parks) tend to be more closely located to the origins and involve more social and routine activities than car-oriented destinations which may involve a parking facility and remote locations visited less frequently (e.g., museums, regional parks, department stores, hardware stores). Certain remote (beyond a walkable distance) destinations, such as large shopping malls or regional parks, may also be important for walking and wayfinding if they include walking elements within them (e.g., mall walking, trail walking in a park) (Farren 2014). Further, origins and destinations that are popular or important to visitors or tourists will be somewhat different from those for residents. While pedestrian wayfinding strategies should not exclude those who are familiar with the area, special attention is needed to ensure that wayfinding guidance is sufficient and clear for those who are not familiar with the area and is targeted to specific destinations that appeal to visitors.

Route The second BME component relates to the quality of the streetscape. Elements include safety (e.g., speed and amount of traffic on roadways, availability of safe crossings, visual surveillance allowing people to see and be seen by others while walking), comfort (e.g., sufficient sidewalk width, comfortable walking surface, availability of shade/shelter), visual quality (e.g., something nice/interesting to see, signs of social disorder such as graffiti and vandalism), and legibility (e.g., the ease of orienting and wayfinding) en route to the desired destination. In terms of the length of the route, due to the slow speed of walking, pedestrians are more sensitive to the distance than drivers or bicyclists. Pedestrians usually, but not always, choose the shortest route, especially when making utilitarian trips (Seneviratne and Morrall 1985; Bovy and Stern 1990). For example, the study of 364 Dutch urban older adults by Borst and colleagues found that while only 20 % of the total walking trips were made using the shortest routes; 82 % of the walking trips were within an extra 20 %

of the shortest route lengths (Borst et al. 2009). While pedestrians typically favor shorter routes, most people appear to be willing to make slight detours if the detours bring other benefits or values, such as easy wayfinding or safe street crossing.

Area The last BME component refers to broader macro-scale conditions of the area around the origins and destinations. These include urban/rural context, density and diversity of land uses, street network patterns, crime rates, and visual quality. Individual components of the urban fabric, such as specific destination locations and routes, cannot be detached from their surrounding contexts such as those discussed earlier in Sect. 10.2. For example, the decision to walk or drive to a specific destination is likely to be influenced by the surrounding context of the specific destination (e.g., a destination in a mixed-use urban center where many other activity opportunities and attractive landmarks coexist versus one isolated location lacking other activity opportunities) or by the specific route to the destination (e.g., safe and visually attractive routes versus routes lacking such features). The concept of *area* captures those contextual factors that are also shown to influence walking behaviors in many previous studies (Saelens and Handy 2008; Lee and Moudon 2004; Parks et al. 2003).

Despite the growing evidence confirming the roles of various environmental features in promoting or hindering walking, the complexity of environment-walking interactions also create challenges. These interactions can vary depending on the population characteristics, community settings/contexts, and types/purposes of walking. The temporal and transient dimensions of the environment (e.g., lighting, micro-climate, weather, traffic, and crowding) also require further investigation, as they appear to influence walking and pedestrian wayfinding decisions. Attributes of community environments that can facilitate either walking or easy wayfinding are expected to share some common principles, as walking and wayfinding are integrated activities (Vandenberg et al. 2016). However, current empirical evidence is insufficient to guide the development of proper wayfinding strategies to facilitate walking. Likely, such strategies will need to be tailored to local conditions, such as population characteristics of visitors and residents, and community environmental conditions related to the specific origins-destinations and the route and area characteristics.

10.4.2 Wayfinding to Promote Walking

Existing empirical evidence on wayfinding-related issues relevant to walking or community walkability is limited to signage systems. Several studies have considered general perceptions of neighborhood legibility, often captured as perceived measures of “ease of finding ways around” and “fear of being lost.” Two studies in Texas that examined parents’ reports of their fear of their children getting lost on the

way to/from school showed its negative relationship with children's walking to school behaviors (Zhu and Lee 2009; Lee et al. 2013).

Although empirical studies are limited, local jurisdictions and non-profit organizations have proposed and developed wayfinding guides and strategies. *Urban Wayfinding Planning and Implementation Manual*, by the Signage Foundation, *Legible London: The Yellow Book*, by Transport for London, and *Wayfinding System Audit*, by Queensland Government, are three examples of wayfinding guidance that considers a wide range of strategies for all transportation mode users, including pedestrians, drivers, and transit users (Signage Foundation 2013; Transport for London 2007; Apelt et al. 2007). Also, private companies like Applied Wayfinding have been assisting many jurisdictions, local neighborhoods, and university campuses worldwide (e.g., London, New York, Bristol, Vancouver) with their wayfinding improvement efforts, employing interactive, evidence-based, and mixed-method approaches.

Several of these documents specifically focus on wayfinding and consider different *types of pedestrians* for their varying wayfinding implications, which has not been done in previous empirical studies. Examples range from a simple program to sponsor a pedestrian-oriented signage system (City of Portland) to comprehensive citywide plans to improve wayfinding and legibility (City of London, U.K.; State of Victoria, Australia). *Legible London: The Yellow Book* classifies travelers into four groups: expert striders, novice striders, expert strollers, and novice strollers (Transport for London 2007) (Fig. 10.2). These different types of walkers require or prefer different wayfinding strategies, and they have different goals of walking and/or different levels of self-efficacy related to wayfinding and/or walking. This document offers an interesting way to segment urban travelers (Transport for London 2007). Strollers travel in a more intuitive, leisurely, and exploratory manner, while striders make primarily destination-driven trips. Therefore, strollers tend to be more opportunistic, while striders focus on efficiency. The differences between the novice and expert walkers are based on the levels of prior knowledge about the area. The State of Victoria, Australia, developed a guide to pedestrian wayfinding which identified a list of important principles and best practices, including two broad approaches for micro-minded and macro-minded people (State of Victoria 2011). The macro-minded approaches included directional signage focusing on landmarks and image- and color-oriented maps; the micro-minded strategies contained broad/contextual and detailed maps, possibly with alternative pathways, street names, and icons or pictograms.

General community wayfinding strategies include barrier-free paths; well-defined routes; clear marking of decision points; simple and consistent signage systems at eye level; clear organization of places/zones with distinctive themes/functions, landmarks, and visual cues; universal designs; and user aids (see also Chaps. 4 and 12). All these strategies should be considered for pedestrians as well as for drivers and other travel mode users. However, these general strategies require further development to more effectively guide pedestrian movements. For example, a signage system should be provided at specific locations along popular walking routes and where pedestrians need to make route decisions (Fig. 10.3a). Signs

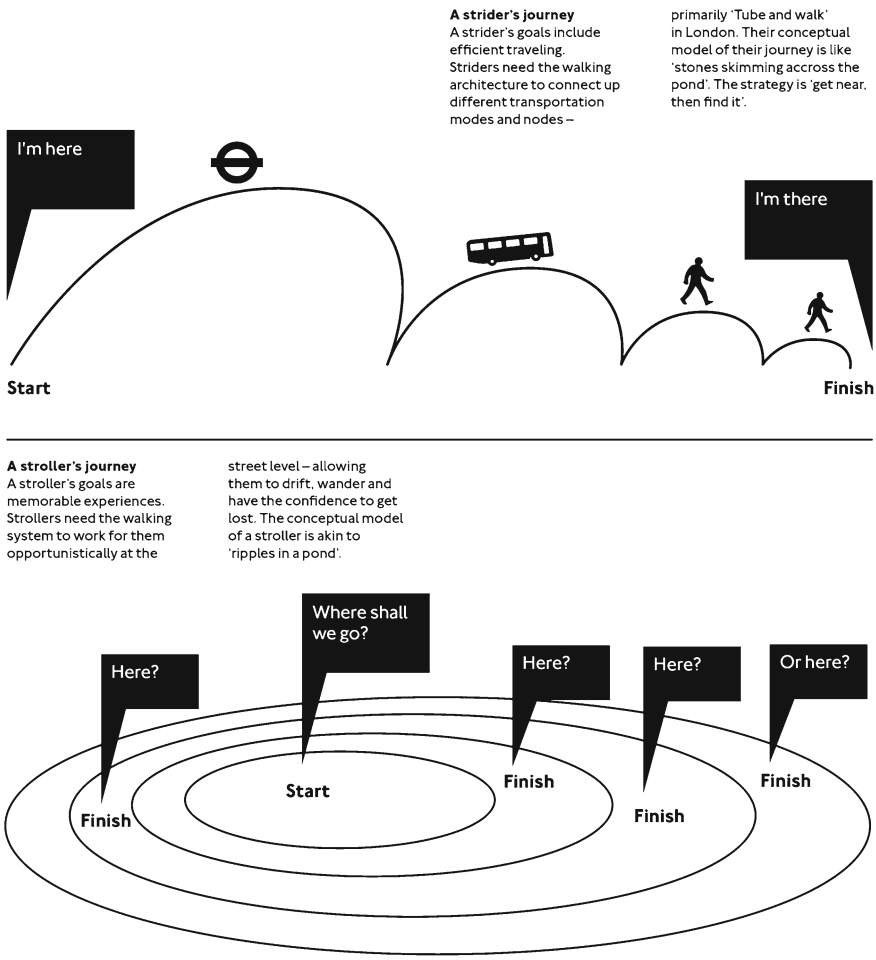

Fig. 10.2 Travelers with diverse goals and journeys: striders vs. strollers (reproduced from Transport for London 2007, 26)

should be posted at pedestrians' eye level, considering typical vertical and horizontal fields of vision for pedestrians. Also, the considerations of sight distances and visibility can be important, especially when the destinations are activity-based locations (e.g., weekend food markets, outdoor festival/performance sites) lacking physical landmarks or signage. In those cases, pedestrians will rely on behavioral cues to locate the sites. For example, 100 ft (30.5 m) is usually considered a maximum threshold for recognizing the presence of people and activities in an area (Zeisel 1984); thus, designers should provide clear sightlines to such destinations from major access point(s) within that distance. In addition to vision, pedestrians are more sensitive to other senses—such as sound, texture, and smell—than drivers

Fig. 10.3 Examples of community wayfinding strategies: (**a**) pedestrian-oriented information system, (**b**) landmarks, (**c**) pedestrian path network, (**d**) edge definition, (**e**) lighting and visibility, (**f**) special populations and sensory stimuli

Fig. 10.3 (continued)

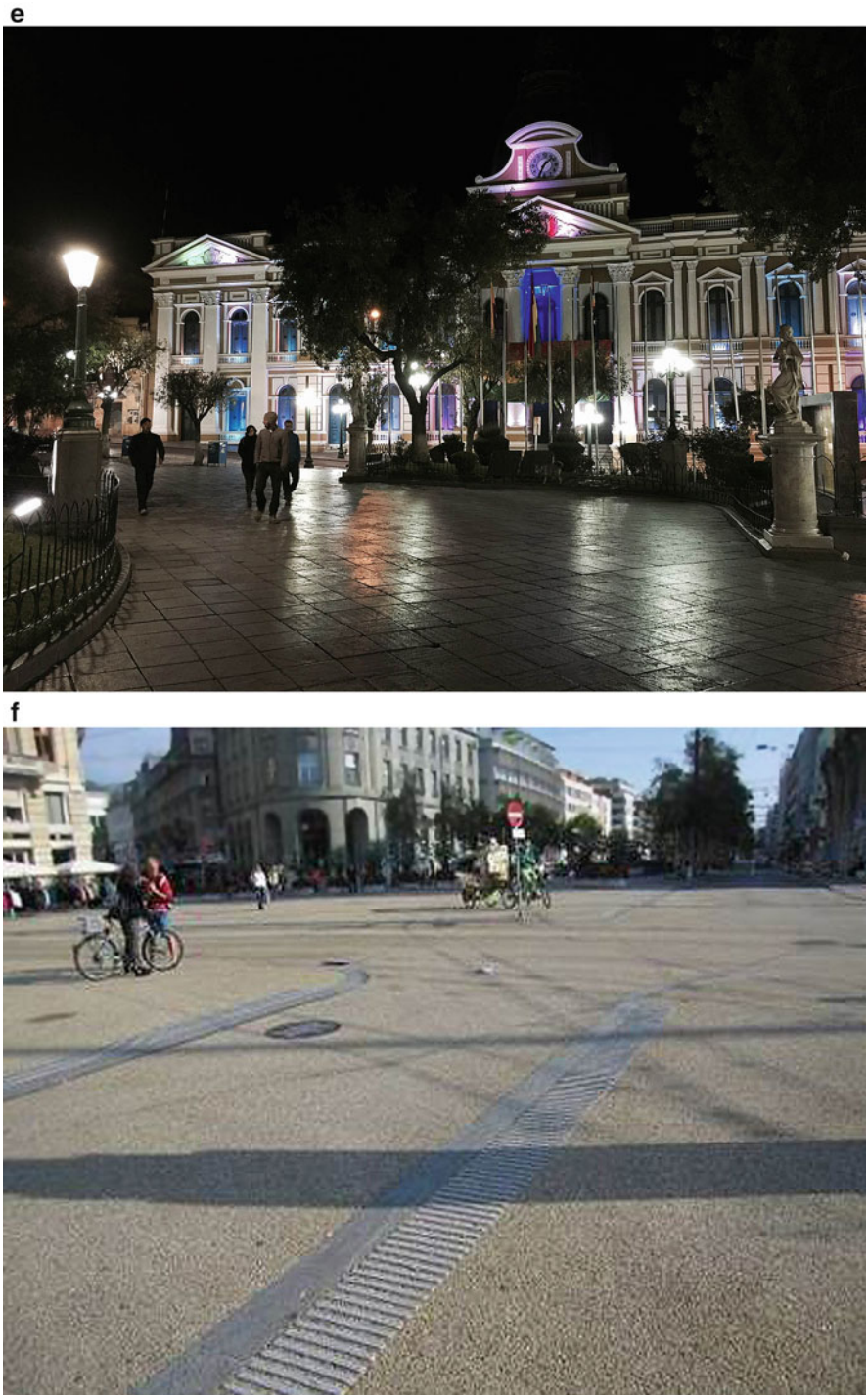

Fig. 10.3 (continued)

or cyclists, and those other senses can be used to aid their wayfinding process (Fig. 10.3f). Further, wayfinding to promote walking should carefully consider additional needs of pedestrians, such as indications of safe pedestrian crossings, sidewalk/path connectivity and availability, walking time to destinations, locations of restrooms/toilets and seating/rest areas, and connections to public transit services.

Although not specifically focused on walking trips, a study of 70 older adults reported that older adults with better spatial cognition (measured from lab tests) and knowledge of their neighborhood (measured with a cognitive map) showed higher levels of neighborhood use (Simon et al. 1992). A review study by Vandenberg and colleagues suggested that several features—local and global landmarks, distinct land marks or visual cues at decision making points along the routes, paths with clear and simple organizations, and adequate signage with wayfinding information—could contribute to improving wayfinding and therefore, walking (Vandenberg et al. 2016 in press). In this sense, wayfinding is an integral component of walking. These features are relevant to several known correlates of walkability such as street connectivity and visual quality; but empirical studies are lacking to understand the interaction or interdependence of specific community features that may support or hinder walking versus wayfinding.

10.4.3 Wayfinding Considered in Walkability Assessment Tools

Another area of significant development in recent walkability studies is the methodology for objectively assessing and quantifying the built environmental factors potentially associated with walking. Often-used objective measurement methods are geographic information system (GIS) techniques and environmental audit instruments. GIS data, if available, are often limited to parcel-level land use, land cover, and street network data. Street and land cover data tend to be more widely available; parcel-level GIS data are still limited in certain U.S. locations and in many countries outside the United States. Therefore, environmental audit instruments have been used to capture the more detailed street-level and three-dimensional data needed to comprehensively study walkability. However, most of the existing audit instruments do not consider wayfinding explicitly or completely. Only one instrument empirically tested with satisfactory inter-rater reliability results and content validity, the CDC-HAN Environmental Audit Tool, includes a scale specifically devoted to capturing wayfinding—especially for older adults (Kealey et al. 2005). The guide by the Queensland Government previously mentioned, *Wayfinding System Audit*, also contains a comprehensive list of wayfinding audit items. They include obstructions/visual clutter, landmarks, entrances, directional signs, locational signs, maps, directory boards, and information desks (Apelt et al. 2007). But no reliability or validity tests have been performed on the guide.

A few wayfinding-related items such as the presence of wayfinding signs, lighting, and/or historic landmarks are included in some instruments, but they do not

represent all wayfinding features potentially important for walking. This limitation has resulted in a shortage of empirical evidence on the roles of wayfinding in promoting or hindering walking (Vandenberg et al. 2016). Perhaps the first step toward advancing our understanding of the roles of wayfinding in promoting walking is the development of a valid and reliable assessment instrument—or a subscale that can be appended to an existing instrument—to capture all environmental elements/features potentially related to pedestrian wayfinding. Such a tool would facilitate the inventory and analysis of relevant items, while considering different types of pedestrians, community settings/contexts/cultures, and purposes/times of walking. Once sufficient evidence has accumulated, a simpler, shorter wayfinding scale containing a small number of selected items most relevant to wayfinding can be developed for use by various stakeholders such as researchers, policy makers, practitioners, and community members.

10.5 Implications for Policies and Practices to Promote Walking via Ease of Wayfinding

Existing evidence on community wayfinding strategies is insufficient to derive detailed implications for policies and practices for promoting walking. However, some general insights can be drawn from a broader body of pertinent literature to facilitate further considerations of wayfinding in walkability-related research and practices. Wayfinding for the purpose of promoting walking has implications for many disciplines, including transportation planning and engineering, urban design and planning, public health, architecture, landscape architecture, geography, and real estate development.

The majority of the empirical and quantitative studies on walkability have been performed in the fields of urban planning and public health, with a growing number of studies incorporating multi- or interdisciplinary perspectives. Walkability discussions within more practice and professionally oriented disciplines such as architecture, landscape architecture, real estate development, and urban design/planning, have not been well integrated into the current scholarly debates on this topic. Therefore, more work is needed to identify walkability and wayfinding implications for and from those disciplines involved in the actual design, planning, and implementation of various pedestrian and wayfinding infrastructure and facilities. One such effort may be research translation (e.g., policy briefs, design guidelines, assessment tool kits) to help facilitate evidence-based approaches in professional practices. Another is research collaboration that builds on the expertise of both public health researchers (e.g., evaluation of relevant health outcomes from design/planning interventions to promote wayfinding/walking) and design/planning professionals (e.g., implementation and evaluation of practical environmental improvement strategies). Such initiatives appear promising in advancing both evidence-based practice and practice-based evidence toward promoting walkability and wayfinding (Green 2006).

10.5.1 Planning

For urban and transportation planning professionals, who have dealt with walking primarily as a transportation mode, the qualities of pedestrian infrastructure (e.g., sidewalks, crosswalks) have direct wayfinding implications. For example, as *area*-related characteristics of BME, the overall connectivity or completeness of sidewalks and the types of networks (e.g., grids, loops and cul-de-sacs, curvilinear forms) are related to the number of route options available to reach a destination and the directness of the route. These conditions have wayfinding implications as to the number and types of wayfinding aids needed to help pedestrians orient and position themselves in the area. As a *route* element, locations and availability of crosswalks along the route to a destination, for example, can either facilitate or deter pedestrian wayfinding and walking by influencing safety and convenience.

Professionals in these fields engage in multiple levels of wayfinding practices directly and indirectly. They help establish policies and guidelines for designating historic preservation zones, significant landmarks, downtown skylines, and building heights and densities. They also contribute to increasing legibility of the urban environments by delineating clear district boundaries and functions. In addition to these large-scale issues, planners deal with decisions related to sidewalks, signals/signs, and special pavements for pedestrians with visual impairments. As previously discussed in this and other chapters in this book, these issues have significant wayfinding implications. Therefore, wayfinding implications should be integrated into the relevant decision-making processes in these fields.

10.5.2 Public Health

Public health disciplines have embraced the notion that multi-level interventions are necessary to effectively facilitate population-level behavior changes, such as walking and other physical activities. The five-tier "health impact pyramid" proposed by Frieden (2010) offers a useful framework to consider the varying levels of impacts expected from different public health interventions. The framework proposes five hierarchical tiers for interventions, starting from (1) socioeconomic factors at the bottom, followed by (2) contextual factors, (3) long-term protective interventions, (4) clinical interventions, and (5) counseling and education efforts. The second tier is where most community-level environmental interventions, such as the pedestrian wayfinding improvements this chapter has discussed, belong. The position of wayfinding in the second tier suggests that wayfinding improvements have the potential to bring broad population-level impacts related to promoting walking and relevant health outcomes. However, wayfinding is only beginning to be explored as a potentially health-significant dimension of the community environment. Wayfinding relates not only to walking, but also anxiety, stress, and mobility limitations which can result from poor community wayfinding. A better understanding of the full

range of health outcomes and consequences of poor wayfinding is needed, along with efforts to incorporate wayfinding into assessment and intervention activities related to walking and health promotion.

10.5.3 Design

Relatively few scholarly efforts are found in the traditionally more practice-oriented fields such as architecture, landscape architecture, urban design, and real estate development. Their practices often have direct impacts on community wayfinding and walkability, suggesting the need to better incorporate pedestrian wayfinding considerations into their decision making during the planning, design, and development process. Professionals in these disciplines help shape various elements and features of the built environment that hold significant wayfinding implications, such as streets, architecture/buildings, open and public spaces, sensory stimuli, aesthetics, and so on. Studies show that distinctive architectural, street, and landscape designs; effective use of landmarks and visual aids and cues; clear delineation of districts (meaningful subareas within a city or community); and use of diverse (visual, tactile, and audial) sensory stimuli can contribute to facilitating pedestrian wayfinding (Vainio 2011). Researchers and professionals in these fields are actively engaged in studies and practices involving the design and implementation of these wayfinding-relevant features. However, the consideration of wayfinding implications has only been implicit or ancillary, with the exception of signage design. The opportunity and need exist for building practice-based evidence around topics related to wayfinding, which can then be translated into evidence-based design guidelines. Practitioners in this field can then use the guidelines to inform relevant design decisions.

10.5.4 Synergetic Efforts

Efforts combining multiple strategies from different disciplines are more likely to be effective than an isolated single-disciplinary strategy. For example, planning and design–related wayfinding strategies (e.g., street network patterns, locations of landmarks, delineation of districts) can be more effective if combined with technology or program-based approaches (e.g., walking route maps with healthy food options marked, made available digitally and/or in hard copy). A study conducted in London discovered that 66 % of travelers and 80 % of tourists considered walking instead of other modes after seeing a walk map; but often those maps were either inaccurate or not available (Middleton 2009). Further, planners and designers of built environments need to pay attention to the specific populations and local communities they are targeting for wayfinding improvements. For example, compared with younger adults, older adults are more likely to find buildings of high public use, symbolic significance, and unique style, and those that have direct access to

streets and naturalistic surroundings, to be important as memorable landmarks (Evans et al. 1984). Further, wayfinding strategies are always specific to the locational and cultural contexts; engaging members of and visitors to the target community throughout the decision-making process is critical, for all types of decision-making processes including research, policy development, and professional practice. Efforts—such as those related to engaging communities and to contextualizing and tailoring wayfinding strategies for specific communities or populations—are expected to bring more effective results if professionals from multiple relevant fields work together and build on their respective expertise.

10.6 Guiding Principles on Promoting Walking via Ease of Wayfinding

I propose seven guiding principles to consider in future efforts related to promoting walking via ease of community wayfinding. The principles include route-based strategies such as signage systems and area-related components such as networks of pedestrian paths and edge definitions. Landmarks, lighting, and visibility are also important wayfinding principles that relate to all three BME domains: origin-destination, route, and area. While the first five principles focus on the physical or spatial elements and conditions important for pedestrian wayfinding, the last two principles respond to the needs of users, walkers in this case.

10.6.1 Pedestrian-Oriented Information System

Signage systems are commonly found components of information systems and have traditionally been the focus of pedestrian wayfinding research and practice. Evidence suggests that implementing a pedestrian-oriented information system with maps, directional signs, and logically named streets can improve pedestrian wayfinding. Signs and maps should be displayed along major pedestrian routes and route decision-making points, and at pedestrian's eye level with appropriate designs, colors, and sizes (Fig. 10.3a). These can be complemented with information available online, in print, and via handheld devices.

10.6.2 Landmarks

Among the most critical and consistently studied pedestrian wayfinding elements, especially those using cognitive mapping methods, are landmarks (Fig. 10.3b). Evidence suggests that providing diverse scales and types of landmarks can be effective in facilitating pedestrian wayfinding. Examples include distant and large landmarks (e.g., tall buildings, mountains, water bodies, bridges) as well as close

and small landmarks (e.g., signage, maps, interesting building façades, historic features, gateway features, clock towers, flag poles, fountains, statues). Urban planning and design policies and practices—such as building height and skyline regulations, architectural design guidelines, historic preservation laws, public art programs, view/vista preservation, and special district designation—can help preserve existing landmarks and create new ones to further assist in pedestrian wayfinding.

10.6.3 Pedestrian Path Network

As an area-level infrastructure condition, simple and clearly organized pedestrian path networks appear important to promoting walking and pedestrian wayfinding (Vandenberg et al. 2016). Supportive path conditions for pedestrian wayfinding may include connectivity and completeness of the network, absence of barriers (e.g., poles, standing water, parked cars in sidewalks, lack of crosswalks and curb ramps), and clear and memorable intersections (Fig. 10.3c). Beyond the utilitarian functions of walking as a travel mode, nicely landscaped streets with visual interests and physical comfort can facilitate wayfinding related to other functions of walking such as exploration and recreation.

10.6.4 Edge Definition

As another macro-scale *area* consideration, clear definition of the edges or boundaries between neighborhoods, zones/districts, and places appear helpful. Such delineations are often made for administrative purposes without sufficiently clear physical and visual boundaries. However, many wayfinding aids, such as maps and addresses, use that administrative boundary information. More distinctive edge definitions (e.g., through visual cues such as gateways, landmarks, signs, street landscaping) can help improve the overall legibility of the area or region and facilitate pedestrian wayfinding and orientation (Fig. 10.3d).

10.6.5 Lighting and Visibility

Many pedestrians travel after dark, and good lighting is a prerequisite for night-time wayfinding. Sufficient lighting along major pedestrian paths, at intersections, on landmarks and signs, and at other major pedestrian destinations is necessary (Fig. 10.3e). Different wayfinding aids may work better during specific times of the

day. For example, certain distant landmarks, such as mountains and tall buildings that are not lit, do not function as effective wayfinding aids at night. The visibility and legibility of many other wayfinding aids also vary depending on the condition of the daylight throughout the day, weather across seasons, and lighting at night. They also vary across different seasons with different seasonal landscape/vegetation conditions. Therefore, wayfinding strategies should respond to the temporal and seasonal variations that can influence pedestrian visibility.

10.6.6 Walker Types and Purposes

Much of the previous work on pedestrian wayfinding has focused on utilitarian or transportation walking driven by destinations. However, people walk for many reasons, such as recreation, exercise, exploration, and socialization. Further, walkers are diverse in terms of age, capacities, and familiarity with the local area. Therefore, wayfinding strategies and types of aids need to move beyond utilitarian walking and address the needs of diverse groups of pedestrians such as children, older adults, persons living with disabilities, and those with limited or no knowledge of a local area.

10.6.7 Special Populations and Sensory Stimuli

Wayfinding aids for those with visual and/or hearing, as well as physical impairments, come with additional sensory stimuli such as sound and texture (Fig. 10.3f). Such additional sensory features can also be helpful to those without impairments and should be considered critical components of a comprehensive wayfinding system when pedestrian infrastructure and facilities are planned and designed.

10.7 Conclusion

Although direct empirical evidence is limited, all of these strategies can help initiate discussions on ways to incorporate wayfinding in future walkability research and practice. Multi-level and multi-sensory approaches that consider the above-mentioned principles and incorporate the technology-based and individually tailored wayfinding aids discussed in other chapters of this book appear promising. Improving pedestrian wayfinding will contribute to promoting walking and to eliciting positive experiences while walking.

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