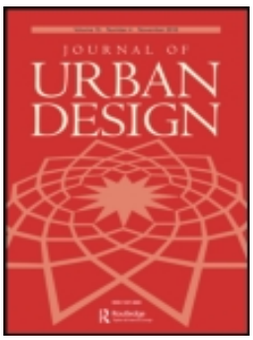

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How Far, by Which Route and Why? A Spatial Analysis of Pedestrian Preference

ASHA WEINSTEIN AGRAWAL[1], MARC SCHLOSSBERG[2] & KATJA IRVIN[3]

[1]*Department of Urban and Regional Planning, San José State University, CA, USA;* [2]*Planning, Public Policy and Management, University of Oregon, USA;* [3]*PMC, Rancho Cordova, CA, USA*

ABSTRACT *This paper reports on a survey of pedestrian trips to transit that examined the trip lengths and route choices made by people walking to five rail transit stations in California and Oregon. In highly motorized countries such as the US, policy-makers are beginning to recognize that shifting some travel from auto trips to walking trips can help the country achieve important policy objectives such as combating obesity and reducing the air pollution and oil dependency that result from auto use. However, researchers know very little about pedestrian behaviour and the role of the built and aesthetic environment in influencing pedestrian trips to transit. As communities wrestle with the interconnected issues of obesity, sprawl, and quality of life, planners need to understand how far Americans will walk to transit and the environmental factors that influence them. This survey of 328 pedestrians walking to rail stations, primarily on weekday mornings, found that they were willing to walk an average of half a mile to the rail station and that minimizing the distance walked was the most important factor influencing their choice of route. The people surveyed also frequently mentioned safety factors as important in route choice. Aesthetic elements of the built environment, on the other hand, were rarely mentioned as important route choice factors. The paper concludes by using these survey findings to recommend strategies that planners, designers, and policy-makers can use to design successful transit and pedestrian-oriented developments.*

Introduction

There is an increasing public interest in community walkability, as reflected in the growing number of state and federal initiatives on Safe Routes to School, the new concern over a national obesity epidemic (especially in children), and a wide range of policy initiatives designed to convince travellers to switch from auto trips to more environmentally sustainable bicycle and walking trips. In each of these cases, policy makers recognize walking as a key mode of travel and believe that increasing the number of walk trips is an important goal.

Despite the seeming simplicity of the goal, very little is known about how far people actually walk or about how street design affects people's willingness or

Correspondence Address: Asha Weinstein Agrawal, Department of Urban and Regional Planning, San José State University, One Washington Square, San Jose, CA 95192-0185, USA. Email: asha.weinstein.agrawal@sjsu.edu

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capacity to access desired destinations on foot. Developing new tools to identify walk trip distances is a key research challenge, as is learning to characterize the local environment from a pedestrian point of view. This paper reports on a survey designed to answer two primary research questions related to the topic of pedestrian behaviour:

(1) How far do pedestrians walk to rail stations?
(2) What environmental factors do they say influence their route choice?

The next section of the paper sets the context for the research by examining related literature. This is followed by a description of the survey methodology, then by an analysis of the survey findings, and finally the paper's conclusions.

Research Context

There is not a well-established literature providing firm answers to either of the paper's two main research questions about how far pedestrians walk and the factors that influence their route choice. While there are many rules of thumb and educated guesses, relatively little research exists on walking behaviour in general, and these topics in particular. Until the mid-1990s, pedestrian behaviour was virtually ignored in the transportation and planning literatures. In the last decade, and especially the last five years, the topic has suddenly become popular and many papers related to pedestrians have been published or are in progress. Much of the new literature has come from the public health community, complementing work done by planning and transportation researchers.

The earliest and largest body of research, which comes from the transportation planning community, assesses the factors that influence people to choose one mode of travel instead of another. In general, the authors of these studies want to understand what factors would shift Americans away from solo driving trips and towards transit, biking or walking. Because the research was usually designed solely to discover why people choose to walk instead of drive, most studies did not examine the distances or routes walkers travelled.

The majority of these studies claim to look at what is often neighbourhoods 'three Ds': density, diversity and design, although in reality the studies tend to focus on the first of the two Ds, density and diversity of land uses. Many researchers have concluded that residents are more likely to walk in dense neighbourhoods that include a diverse mix of non-residential uses within a short distance (Cervero & Gorham, 1995; Cervero & Kockelman, 1997; Greenwald & Boarnet, 2001), although a subset of the research community remains unconvinced that the association is very strong, except for comparisons between extremely high and extremely low densities (Badoe & Miller, 2000; Crane, 2000).

Despite the rhetoric about the three Ds, micro-scale urban design and environmental factors were often ignored, probably because no pre-existing datasets captured design factors such as the presence of greenery, attractive buildings, smooth and wide sidewalks, traffic control devices to aid pedestrians crossing the street or the presence of heavy traffic. In North America and Europe, from the 1970s to the 1990s there were only scattered studies on the link between the local environment and walking, with many of these focusing on how heavy traffic volumes discourage walkers (e.g. Carp, 1971; Lövemark, 1972; Nielson & Fowler, 1972; City Engineering Department, Vancouver, BC, 1978; Mitchell

& Stokes, 1982; May *et al.*, April 1985; Seneviratne & Fraser, 1987; Hopkinson *et al.*, December 1987; Hoxie *et al.*, 1994; Handy, 1996; Shriver, 1997). Since 2000 there has been a burst of enthusiasm for taking on the design question more rigorously, with a number of studies on the topic appearing in the last decade (e.g. Pikora *et al.*, 2002; Kirtland *et al.*, 2003; Rodríguez & Joo, 2004; Ewing *et al.*, 2005). However, researchers have quickly discovered that pedestrian behaviour is highly complex and difficult to study, and the existing body of research points to few consistent findings. A recent review of the evidence linking physical activity with the built environment concluded that there is limited evidence showing a connection between neighbourhood design and walking, but that further research is needed to determine whether there is truly no link or if existing research has not been designed properly to reveal real relationships (Committee on Physical Activity, Transportation Research Board, 2005).

There is even less literature looking specifically at how far pedestrians walk than there is about what factors influence people to walk. The main sources of information are the US Census, National Household Travel Survey and regional household travel surveys. These surveys often report the number of walk trips made, but do not necessarily include trip distances, and even when they do, the data is often suspect (Agrawal & Schimek, forthcoming). For example, in the 2001 NHTS, surveyors recoded many walk trip distances to the nearest *mile*. Given that most walk trips are quite short, this recording method makes the data almost useless for understanding walk trip distances with any precision.

In terms of how far pedestrians walk to access rail specifically, most of the existing data are collected by transit agencies conducting internal surveys of their passengers. Researchers usually do not have easy access to the data because no centralized databanks collect such surveys. In addition, these surveys usually ask respondents to *estimate* the distance they walked, and thus the data may not be highly accurate. However, one study from the mid-1990s gathered a few such surveys from the United States and Canada and conducted a survey of light rail riders in Calgary, Canada. The authors found that the median walking distance in Calgary was about a fifth of a mile, although at suburban stations it was twice that distance (O'Sullivan & Morrall, 1996).

Methodology

In the survey conducted for this research, respondents answered a series of questions about how far and how long they walked to the station, what factors influenced their choice of route, their attitudes towards walking, and some basic demographic questions. They also drew on a map the route they walked and any locations they avoided on their walk.

Surveys were distributed at five rail stations. Two were in the San Francisco Bay Area, in California: one in San Jose (Japantown) and one in El Cerrito (El Cerrito Plaza). The other three were in Portland, Oregon (Hollywood, Gresham and Rockwood). The primary criteria for selecting the station areas was to find neighbourhoods where pedestrians would have a reasonably high number of different route options between their home and the station. It was assumed that people would not be willing to walk more than a short distance out of their way to find a nicer route, and so the study selected only neighbourhoods with streets laid out in a grid pattern. With a grid street pattern, respondents could choose among multiple routes that were all approximately the same distance. Neighbourhoods

were also chosen where walkers would have a mix of local and collector or arterial streets, as well as both residential and mixed-use or commercial streets.

The Stations

Japantown station, San Jose, California. The Japantown station, in San Jose, California, is part of the Santa Clara Valley Transportation Authority's light rail system. The station is located in historic Japantown, an area of traditional neighbourhoods just outside of downtown San Jose. Built environment conditions in the area vary substantially from block to block. Several medium and high density residential projects have been completed since 2000 to the east. To the west, much of the land is designated for open space to protect an airport flight path.

El Cerrito Plaza station. The El Cerrito Plaza station is part of the Bay Area Rapid Transit system (BART), which serves four counties in the San Francisco Bay Area, California, region. The neighbourhood around the station is laid out in a grid street network. The area is primarily residential, with several commercial streets, plus a large shopping centre south of the BART station. Underneath the BART tracks runs a popular bicycle and pedestrian path. The catchment area for potential walkers to the BART station is quite large. There are no major barriers created by freeways or other features of the built environment, except that walkers do face some hills in neighbourhoods rising up a moderately steep hill a few blocks to the east.

Figure 1. Looking east to Japantown station.

Figures 2 and 3. Looking east to El Cerrito Plaza station. Hollywood station, located between heavy rail and the freeway.

Hollywood station. Hollywood and the following two stations are part of Portland's TriMet Max Light Rail system. They all lie east of downtown Portland. Hollywood station sits between a freeway and a heavy rail line and pedestrians access it from either side by a pedestrian footbridge. One side of the station consists mainly of residential housing, with mostly residential streets closest to the station. The other side of the station is bordered by a bus drop-off zone, commercial and office space and a combination of multi-family and single family residential sections. Two fairly heavily used arterials bisect the space to this side of the station.

Gresham station. Gresham station is adjacent to a centralized bus hub, and the two transit facilities combined are considered one of TriMet's transit centres. The Gresham area was developed prior to World War II, and to the south and east of the station there is a street grid pattern typical of that era. There are no arterials or other major roads between this residential area and the station. Outside this gridded area there are a number of major roads, some within a quarter-mile of the station. There are also large commercial areas and offices nearby and a mixture of both single family and multi-family residential areas.

Rockwood station. Rockwood Station sits on a busy commercial corridor with multi-family and single family residences adjacent to it in all directions. There are signalized crossings at adjacent arterials, but the distances to cross are quite long. Directly across from the westbound platform sits a large commercial lot that is currently unoccupied, although it has become an informal park-and-ride lot.

The Surveys

Surveys were distributed at transit stations to people who walked to the transit stop. Between one and three surveyors distributed surveys, depending on the day and station, and they worked between 6 am and 10 am mostly on weekday mornings, from February to May 2006. The surveyors followed a script for consistency. The surveyors asked each person if s/he had walked to the station, and those who responded 'yes' were asked follow-up questions to determine their

Figure 4. Looking at both sides of the Gresham station.

Figure 5. The west-bound train at the Rockwood station.

eligibility for the study: (1) if they were over 18 years of age, and (2) if they would be willing to participate in the study. Willing survey respondents received a written survey.

At four of the stations, which had low passenger volumes, surveyors approached all people waiting at the station and asked how they arrived at the station. At the El Cerrito BART station, which has higher ridership, the surveyor approached a randomly selected sample of the riders waiting on the platform.

The six-page paper survey was relatively quick to complete because there were only a few questions per page. In addition to a set of both closed and open-ended questions, the questionnaire included a full-page map and asked respondents to trace the route they walked that day to the station. Surveyors gave out pens with the surveys, and several respondents finished them on the

Table 1. Survey response rates, by station

Station	No. completed, usable surveys	Response rate[a] (%)
El Cerrito Plaza	120	71
Japantown	90	49
Hollywood	78	45
Gresham	15	15
Rockwood	25	23
Total	328	45

Note: [a]Response rate is defined as the number of surveys returned as a proportion of the number of surveys distributed. Some riders contacted were not given a survey because they had not walked or refused to participate.

platform. The surveys included pre-stamped envelopes, so many people completed the survey later and dropped it in the mail.

The survey included three sections:

(1) Questions on walking behaviour, preferences, and route choice.
(2) A map inserted in the survey on which respondents were asked to trace their walking route. Respondents were also asked to mark intersections and streets they avoided on their walk if they had not indicated them in writing in the first part of the survey.
(3) Basic demographic questions.

A total of 728 surveys were distributed and 328 surveys were returned by respondents. Table 1 shows the number returned per station, as well as the response rate per station. Almost two-thirds of the surveys (64%) came from the two Bay Area stations; over one-third of the surveys came from El Cerrito Plaza station and just over another quarter came from the Japantown. Of the remaining surveys, almost a quarter came from Portland's Hollywood station (24%), and the Gresham and Rockwood stations in Portland provided the remaining few surveys.

The response rate for the survey was quite high. For the total population, the response rate was 45%. El Cerrito Plaza had the highest response rate, 71%, while response rates from the other stations ranged from 15% to 49%. The response rate was calculated as the number of surveys returned as a proportion of the number of surveys distributed. Some transit riders approached by the surveyors were not given a survey to complete because they did not wish to participate or because they had not walked to the station.

Although some surveys had missing responses for a few individual questions, all of the surveys were complete enough to be included in the final dataset. However, the number of responses contributing to the results varied slightly for each question.

Analysis of Survey Findings

This section of the paper first describes the basic socio-demographic characteristics of the survey respondents, and then discusses the results of the survey. Sections discuss respondents' trip purposes, how many people stopped along their walk and what for, how far respondents said they walked, as well as

the authors' own calculations of the distances they travelled, the factors that influenced their route choices and their attitudes towards walking.

Who Were the Survey Respondents?

Table 2 summarizes some socio-demographic statistics about the survey respondents. They were approximately half male and half female, about three-quarters self-identified as white, and three-quarters were adults between the ages of 30 and 59. The median household income was $60 000, and slightly over half the respondents said they rented their home. Almost one-third of the group rarely or never had access to a car, indicating that a fairly high proportion of the respondents were transit-dependent.

The groups of respondents from each station were all approximately similar to the total population of respondents, with just a few notable differences. The Bay Area respondents were a racially diverse group, while the Portland respondents were nearly all white. In addition, the small sample of respondents from the Portland stations of Gresham and Rockwood had considerably lower household incomes and, correspondingly, were more likely to rent than own their homes. The

Table 2. Demographics of survey respondents

		Bay Area		Portland		
	All stations	El Cerrito	Japantown	Gresham	Holly-wood	Rock-wood
Gender						
Male	53%	49%	66%	40%	47%	52%
Female	47%	51%	34%	60%	53%	48%
Race						
White	74%	68%	59%	93%	96%	86%
Black	2%	0%	2%	0%	1%	9%
Asian/Pacific Islander	15%	23%	20%	0%	1%	5%
Other	5%	4%	11%	0%	0%	0%
Mixed race	5%	5%	9%	7%	1%	0%
Age						
18–29	19%	15%	25%	23%	15%	29%
30–39	30%	34%	26%	15%	32%	29%
40–49	23%	20%	26%	39%	25%	13%
50–59	20%	25%	12%	8%	23%	25%
60 +	8%	7%	10%	15%	6%	4%
Household income						
Median	$60 000	$80 000	$60 000	$35 000	$70 000	$20 000
Own/rent home						
Own	44%	45%	38%	29%	60%	21%
Rent	56%	55%	62%	71%	40%	79%
Driver's licence?						
Yes	84%	91%	76%	80%	86%	75%
No	16%	9%	24%	20%	14%	25%
Access to a car						
Never/ occasionally	30%	16%	36%	33%	32%	67%
Most of the time/always	70%	84%	64%	67%	69%	33%

Rockwood population was also highly transit dependent, with 67% saying that they never or only occasionally had access to a car.

Trips' Purposes and Origins

Most respondents made home-based trips to work, as would be expected given that the sampling took place during weekday mornings. Among the full population, 81% made commute trips, another 5% made trips to school and 8% made personal shopping trips. This pattern was almost consistent across all the stations, except that Japantown had fewer commute trips and considerably more shopping trips (21%), whereas Gresham riders made fewer commute trips and more trips to school (33%).

Stops During the Trips

The survey asked respondents if they had stopped along the way to the rail station. If they had, follow-up questions probed the reason for the stop and its duration. The vast majority, 87%, did not stop. Of the 13% of respondents who did stop, about half stopped to buy food or a drink. The others stopped to buy a newspaper, to talk to somebody, or for 'other' reasons. The median time for these stops was just 3 minutes, consistent with stops made by people popping into a retail business to make a quick purchase. The average stop time was longer, at 6 minutes, reflecting the fact that some people did stop for much longer time periods (up to 45 minutes for the longest stop).

Trip Distances

Self-reported distances. Respondents were asked how far they had walked, in both miles and blocks. Almost all respondents entered the number of blocks (91%), but only 64% entered the distance in miles. (The question was formatted on the page with a space to enter the distance in miles followed by a space to enter the number blocks on the same line. This particular layout on the page may have encouraged some people to think they only needed to enter the information in one form.)

For the full group of respondents, the mean reported distance was 0.58 miles (see Table 3). Looking at how the data broke out in quartiles shows that a quarter of people reported walking just a quarter of a mile or less, the second quartile of people reported walking between a quarter mile and a half mile, the third quartile reported walking between half a mile and almost a full mile (0.95 miles), and the final quarter said they walked more than 0.95 miles. The responses clustered around 0.25, 0.5 and 1.0 miles, indicating the tendency of people to round off distances.

Actual distances. Respondents were asked to trace on a map the route they walked. For the El Cerrito, Japantown and Hollywood stations, these routes were entered into a GIS database and the information used to calculate the exact length of each trip. The mean trip distance was just over a half mile (see Table 4), with the shortest trip being 0.02 miles and the longest 1.88 miles. Looking at the distance data broken into quartiles shows that a quarter of respondents walked a quarter mile or less, the next quartile walked between a quarter and half mile, the third

Table 3. Self-reported distance walked in miles, blocks and minutes

		Bay Area		Portland		
	All stations	El Cerrito	Japantown	Gresham	Hollywood	Rockwood
Distance in miles						
Mean	0.58	0.65	0.45	0.43	0.62	0.49
25th percentile	0.25	0.25	0.13	0.11	0.39	0.25
50th percentile	0.50	0.50	0.28	0.30	0.50	0.50
75th percentile	0.95	1.00	0.69	0.80	1.00	0.75
Distance in blocks						
Mean	6	6	4	4	8	5
25th percentile	3	3	2	2	4	2
50th percentile	5	5	4	2	6	3
75th percentile	8	8	6	4	10	6
Time (minutes)						
Mean	10	11	8	7	11	10
25th percentile	5	6	5	3	5	5
50th percentile	10	10	6	6	10	10
75th percentile	12	15	10	10	13	13

quartile walked between a half and two-thirds of a mile, and the final quarter walked over two-thirds of a mile.

The accuracy of self-reported distances. The study was interested in learning how accurately respondents estimated the distances they had walked. Many travel surveys ask respondents to estimate the distances they walk, but little is known about how accurate these estimates are. Almost half of the respondents (43%) guessed quite accurately, within a tenth of a mile (see Table 5). However, other guesses were highly inaccurate, ranging from up to 1.07 miles over to 0.88 miles under the correct distance. The average guess was off by about 0.2 miles. Percentage-wise, guesses were on average off by 45% of the distance, with 25% of respondents guessing within 11% and half guessing within 30% of the correct distance in miles. (Since the distances walked were short, the actual error in miles was trivial for most respondents.) On the other hand, 25% of respondents' guesses were off by more than 50%, a surprisingly large error, and 10% were off by more than 90%. Overall, almost as many people over-estimated as under-estimated, with no conclusive pattern showing up.

Table 4. Actual distances walked

	Distance (miles)
Mean	0.52
Minimum	0.02
Maximum	1.88
25th percentile	0.27
50th percentile	0.47
75th percentile	0.68

Table 5. Accuracy of self-reported trip distances

Accuracy of distance estimate	%	Cumulative %
Within 0.1 mile	43	43
Off by 0.1 to 0.25 mile	31	72
Off by 0.25 to 0.5 mile	20	94
Off by >0.5 mile	6	100

Factors Influencing Route Choices

After the survey respondents traced the route they walked on a map, the survey asked them to identify the factors that led them to choose the route they took. The survey addressed this issue in three steps. First, respondents were asked the open-ended question, "What are the main reasons why you chose your route today?" and given space to write three answers. On the next page, respondents were asked to rank the importance of 11 potential factors that might have influenced their route choice. The instructions read: "Below is a list of factors that other researchers have found to influence the routes people walk along. For each one, please mark how important it is to you". Finally, the last open-ended question asked: "Are there any other factors, positive or negative, that influenced your choice of route today?" Relatively few people answered this final question, so only the results of the first two questions are discussed below.

The first question, the open-ended one, showed that by far the most important factor was choosing the shortest or fastest route. As shown in Table 6, 52% of respondents mentioned this as the first item in their list, and almost two-thirds mentioned this somewhere among their three responses. An additional 9% of respondents mentioned "convenience" as an important factor, and it may well be that convenience was their way of expressing the same concept—choosing the quickest route.

The second most common set of responses had to do with safety, mentioned by 28% of respondents. Most of these related in some way to safety from traffic—people mentioned issues such as low traffic volumes or an intersection where it was easy to cross a large street—with only a few mentioning crime safety issues. Although safety was a popular response, only 8% of people mentioned it as their first item on the list; safety was somewhat more common as the second item,

Table 6. Percentage of people volunteering a factor as influencing their route choice

Question: What are the main reasons why you chose your route today?

Factor type	Anywhere in list	First	Second	Third
Shortest/fastest	64	52	10	3
Safety	28	8	14	6
Convenience	9	6	2	1
Attractive	8	2	3	2
Habit	6	3	1	2
Stopped at a business	3	2	2	0
Other	27	13	9	5
Unintelligible responses	16	9	5	3
Left blank	N/A	3	50	77

appearing here 14% of the time. Finally, very small numbers of respondents mentioned choosing their routes based either on the attractiveness of the route (e.g. nice landscaping or attractive buildings) or because they wanted to stop at a particular business.

These priorities were partially validated in the next question, which asked respondents to rate the importance of 11 different factors. As shown in Table 7, 99% of respondents rated choosing the shortest route as either very important or somewhat important, with the bulk of those saying it was very important (82% of respondents). This finding confirms the results of the open-ended question, where responses related to distance predominated. Moreover, the study independently calculated respondents' shortest route using GIS, and respondents consistently did choose an optimized path from home to the transit stop.

Safety considerations showed up as considerably more important in the second question than they did in the previous, open-ended question. About half of respondents rated as very important having traffic devices present and having traffic drive at safe speeds; those numbers jumped considerably to 85% and 87% when the responses of those who responded that these factors were either very or somewhat important were combined. Women were more likely than men to rate safety factors as important: 69% rated as very important the presence of traffic compared to 43% of men, and 36% of women rated as very important the presence of other people on the street compared to 12% of men.

Other factors that were rated as very or somewhat important by at least 50% of respondents were having sidewalks in good condition; the presence of attractive buildings, trees and landscaping; having no traffic lights where it took a long time to cross; the presence of other people out walking; and having shops or businesses to stop in. However, only the first two of these were rated as very important by at least one-third of respondents. Finally, three factors rated as important by relatively

Table 7. How respondents rated the importance of factors that might influence their route choice

Question: Below is a list of factors that other researchers have found to influence the routes people walk along. For each one, please mark how important it is to you.

Factor	Very important	Somewhat important	Not important
Shortest route	82%	17%	1%
Traffic devices are present	55%	30%	15%
Traffic drives at safe speeds	46%	41%	13%
Sidewalks in good condition	43%	44%	13%
Presence of attractive buildings, trees, and landscaping	35%	44%	21%
No traffic lights where it takes a long time to cross	29%	39%	32%
Other people out walking	23%	37%	40%
Shops/businesses to stop in	14%	32%	54%
Shops/businesses with window to look in	11%	25%	65%
Benches/places to sit	11%	15%	75%
Friend/neighbour along the route	7%	18%	75%

Note: Factors were ordered differently in the survey itself.

few people were having shops or businesses with windows to look at; having benches or other places to sit; and having a friend or neighbour along the route.

Attitudes towards Walking

Towards the end of the survey, respondents were asked how strongly they agreed with a series of statements describing different reasons that they might choose to walk. Overall, respondents had very positive attitudes towards walking, perhaps explaining their high level of willingness to complete and return the survey. The first two questions asked people if they liked walking and if they found walking relaxing, and in both cases 97% either strongly agreed or agreed with the statement (see Table 8). Another question asked respondents if they walked in order to get exercise or health benefits, and again virtually all agreed or strongly agreed (94%). Slightly lower percentages of people agreed that they sometimes walk because it is the most convenient mode of travel (89%) or because it is the cheapest way to travel (80%).

Study Findings and their Implications for Design and Planning

This study surveyed pedestrians walking to five rail stations to determine how far they walked and the factors that they believed influenced their choice of route. The survey results suggest four primary conclusions that have important implications for designers and planners working to improve the built environment for pedestrians.

(1) Pedestrians walk considerably farther to access rail stations than commonly assumed

Conventional wisdom among planners has often been that pedestrians in the US will only walk a quarter to a third of a mile for any reason, including to access transit. A paper from the mid-1990s looking at how far transit agencies and transportation modellers assume that pedestrians will walk to a light rail stations found very short distances, most well under a half mile (O'Sullivan & Morrall, 1996). The results of the study here suggest quite a different reality, at least for walk trips to access rail transit. Half the people surveyed walked *at least* a half a mile to access the train station (the median trip distance was 0.47 miles). This

Table 8. Attitudes towards walking

Question: For each statement below, please mark how strongly you agree or disagree with it.

Statement	Strongly agree %	Agree %	Disagree or strongly disagree %
I like walking	78	19	3
Walking is relaxing	70	27	3
I walk to get exercise or other health benefits	71	23	6
I sometimes walk because it is the fastest and/or most convenient way to get somewhere	55	34	12
I sometimes walk because it is the cheapest way to get around	46	34	19

result indicates that planners and designers laying out transit-oriented developments can assume that many train riders will be willing to walk considerably farther to the station than they may have previously thought, at least for commute trips.

(2) Pedestrians believe that their primary consideration in choosing a route is minimizing time and distance

The survey explored the reasons that pedestrians choose particular routes in two ways, first asking an open-ended question and then asking respondents to rate the importance of a list of factors that might have influenced them. In both cases, respondents overwhelmingly indicated that their first priority was choosing the most direct and/or quickest route. This emphasis on convenience is probably representative of all pedestrians, although it might also be particular to the study respondents, who were making a morning commute trip, when time pressures are likely to be of particular concern. This caveat notwithstanding, the results suggest that designers and planners laying out neighbourhood street patterns should create direct routes for pedestrians to access all major destinations.

(3) Secondary factors influencing route choice are safety and, to a lesser extent, attractiveness of the route, sidewalk quality and the absence of long waits at traffic lights

In both the open-ended and closed-ended questions about route choice, the most highly-rated factors after distance related to safety. In the open-ended question, safety factors were the only other issue listed by over a quarter of respondents. In the closed-ended questions, about half of respondents rated as 'very important' having traffic devices present and traffic driving at safe speeds. The next most-cited very important factor was having sidewalks in good condition (43%). Aesthetic issues, in the sense of attractive landscaping or buildings, were rated as very important by 35% of respondents, but mentioned by only 8% of the respondents in the open-ended question. These two percentages, especially the latter, indicate that environmental appearance was considerably less of a concern than convenience and safety. The only other issues rated as very important by at least a quarter of respondents were having other people present (which may be a safety-related concern), and the absence of traffic lights with a long wait.

When interpreting these results, it is important to remember the context in which respondents answered. First, all were thinking about a commute trip in the morning; for other trip purposes, their responses might vary. (For example, the appearance of the built environment might be more important for leisure or shopping trips.) In addition, audits of the neighbourhoods around the five stations, which were conducted for this study, showed that the pedestrian environment was relatively safe from crime and traffic, and most of the residential streets were at least moderately attractive environments (Schlossberg *et al.*, 2007). That is, the condition of properties, presence of sidewalks, general tree cover and other types of urban form elements displayed no obvious warning or danger signals for pedestrian movement, even though conditions varied somewhat across the neighbourhoods. Had the survey been conducted in more run-down neighbourhoods, respondents might have placed higher priority on the visual quality and maintenance of the built environment.

(4) To increase walking, focus public resources on providing direct and safe routes

Overall, the study results suggest that planners trying to encourage walking should focus on creating direct routes and street-crossings that feel safe to pedestrians. In fact, it may be that street crossings should be the key focus for designers since these often represent the greatest real and psychological travel barrier and trip delay for pedestrians.

Although improving neighbourhood aesthetics is critically important for many reasons—such as making walking more pleasant, creating a neighbourhood sense of place and perhaps encouraging recreational walking—these design factors appear less critical in people's decision of whether or not to walk for the utilitarian purpose of getting to a rail station. Perhaps the fundamental question that urban designers and planners wanting to promote walking should ask is not "How can good urban design induce greater numbers of walking trips?" but "What is the minimum standard of design that will accommodate people who want to make utilitarian walk trips?"

Recommendations for Future Research

In addition to lessons for practicing designers and planners, this study suggests several avenues for further research, both on how to design pedestrian surveys and additional research topics related to the impact of the build environment on pedestrians.

A first key finding about pedestrian survey design is that asking respondents to trace their walking route on a local map—a relatively untested method in walk trip research—works well. For this study, it was unsure whether respondents would be willing to provide this information or if they would fill out the map clearly so that the data would be useful. The study results show that the survey technique is highly effective. Of the 328 surveys received, the map was filled out 93% of the time, and a total of 261 traced routes were usable to analyze for actual distance and other route characteristics. These route tracings were legible and precise enough that the research team had no trouble transferring the exact routes into a GIS database where the distance could be automatically calculated. In addition, the relatively high response rate for the survey (45% of distributed surveys were returned) shows that the presence of the map did not discourage people from completing the survey. Future researchers needing to assess the precise distances and routes people walk should consider asking respondents to draw their routes on a map.

A second key finding is that pedestrians vary considerably in how accurately they estimate the distance of a regular walk trip. Many travel surveys ask respondents to self-report the distances they travel. To date, there has been little information on how accurate those self-reported estimates might be. This study found that, on average, the difference between actual and perceived distance is modest. At least half of all respondents guessed within 0.13 miles of their actual route length. However, 25% of respondents' guesses were off by more than 50%, suggesting that a substantial minority do not have a precise idea of how far they walked. A few of the individual guesses were also substantially off in terms of distance, as well as percent: guesses ranged from up to 1.07 miles over to 0.88 miles under the correct distance. Other surveys asking people to report the distances about similar trip types probably have similar (in)accuracies, although the study

results should not be assumed to hold true for self-reported distances of other trip types. This study asked people to estimate the distance of a route they walk routinely; people probably guess less accurately for trips they do not make regularly. In addition, people walking significantly longer distances might estimate distances less accurately than the respondents here, who were walking relatively short distances.

The study also suggests new topics meriting further study. One useful variation on the project described here would be to survey people taking different types of trips. Future studies could target pedestrians walking to destinations such as shopping, local services or schools to see how far they travel and whether they similarly prioritize fast and safe routes. The study methods could also be applied to different populations. The elderly, children and adults who do not work outside the home might have very different route choice preferences from morning commuters. A third useful application of the study methods would be to research a neighbourhood with more overtly unpleasant walking conditions. The study areas investigated were relatively safe, and while not all corridors were exactly beautiful, there were few obvious deterrents to walking such as vacant lots, abandoned buildings or highly dangerous intersections. Research in less pleasant neighbourhoods could investigate whether pedestrians are willing to shift their routes when the difference in quality between good and bad blocks is more extreme. More detailed investigation is needed into the relative strength of the pull of a nice environment and the push of an unpleasant one.

The need for design researchers to focus on the push of unpleasant environmental design factors was highlighted by a related part of this research project not covered in this paper (Schlossberg *et al.*, 2007). In addition to surveying pedestrians, a comprehensive audit was conducted of the physical environment around the Japantown and the El Cerrito Plaza rail stations, and pedestrians were also asked to indicate locations they avoided. These audits and survey questions revealed that arterials or collectors, rather than residential streets, were the areas respondents most often identified as poor walking environments. These findings indicate that designers and planners should focus their attention on arterial and collector streets. In essence, the planning and design focus for walkability in many neighbourhoods might become, "What makes a major collector or arterial road more or less pedestrian friendly?" Researching route choices and route avoidance by pedestrians along high-traffic-volume streets would allow policy makers to focus resources and interventions where they are most needed.

Conclusion

As communities wrestle with the interconnected issues of obesity, sprawl and quality of life, this study offers rays of hope. People walked longer distances to transit stations than previous research seems to indicate. For planners and urban designers, this finding expands the community canvas within which to ply their craft. In addition, the study found that pedestrians tend to value quick routes over any other explicit characteristic of the pedestrian environment, at least for the morning commute. This finding suggests that building basic path infrastructures that offer direct and safe connections to popular destinations is enough to support utilitarian walk trips, even if budgets do not permit aesthetic enhancements along those routes.

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