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PEDESTRIAN NEEDS AND ACCOMMODATIONS:

A STUDY OF BEHAVIOR AND PERCEPTION

January 1975

Final Report

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U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration
Office of Program and Policy Planning
Socio-Economic Studies Division

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By the

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16. Abstract

This report documents a study of pedestrian behavior and perception to identify pedestrian needs and accommodations. The techniques used to study pedestrians included (1) Survey polls of pedestrians at different locations, (2) Observation of pedestrians along their walking routes, and (3) Photography to supplement the first two approaches. Taken collectively, these techniques determined actual pedestrian conditions.

The study of pedestrians produced two significant conclusions. The first is that pedestrians rarely express emphatic reaction to the walking environment. The second is that pedestrian behavior responds in characteristic ways to environmental conditions. These conclusions suggest the following action-oriented policies which are proposed in this report:

(1) A leadership program of pedestrian improvements should be initiated to accommodate pedestrian needs, and to stimulate the environmental consciousness of pedestrians.

(2) Offensive and inconvenient pedestrian conditions should be rectified.

(3) A program of pedestrian improvements should be directed to the whole pedestrian network of a city.

(4) Incentives should be given to the users of land adjacent to the pedestrian right-of-way to make pedestrian improvements.

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LYLE C. FITCH, PRESIDENT

SUMNER MYERS, DIRECTOR
URBAN SYSTEMS STUDIES

January 31, 1975

Mr. H. G. Gale, Contracting Officer
Contracts & Procurement Division
Federal Highway Administration
Department of Transportation
Washington, D. C. 20590

Dear Mr. Gale:

I am pleased to transmit the IPA Final Report of Pedestrian Needs and Accommodations: A Study of Behavior and Perception. This report not only sheds new light on pedestrians' behavior and their environment, but also proposes design criteria to accommodate their behavior. The report is a product of extensive study of pedestrians to determine their expressed and observed needs, and to identify appropriate pedestrian accommodations.

The methodology described herein was developed jointly by us, the contractor, and the Federal Highway Administration. The findings, conclusions and recommendations were developed by the Institute of Public Administration and October, subcontractor for urban design. Alex Eckmann of IPA was the Project Director.

Sincerely,

Sumner Myers

Sumner Myers
Urban Systems Studies

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REPORT SUMMARY

Our study of pedestrians has produced two significant conclusions -- the first based on the results of a survey of pedestrian attitudes and perception; the second based on the authors' observations of pedestrian movements and behavior.

The first conclusion is that pedestrians generally express unconcern with the walking environment. They rarely make emphatic statements about walking conditions, either positively or negatively. When auto traffic is hazardous, or noise and pollution are particularly offensive, or crowding makes sidewalks impassable, pedestrians articulate only mild protest. When benches, landscaping and other amenities are abundantly provided, they state only modest satisfaction. But when conditions are neither very good nor very bad, their remarks about these conditions are passive and unconcerned.

The second conclusion is that pedestrians' personal identity traits and particular situations cause them to behave in characteristic ways. The location of pedestrians in the pedestrian network, their trip purpose, and their age have discriminate influence on their behavior.

Findings in Support of First Conclusion

Relatively few pedestrians expressed discontent with traffic controls or problems with vehicular traffic:

-- Only 13 percent said they had to wait "too long" before crossing intersections.

-- Only 20 percent said they were not given enough time to cross intersections.

-- Only 14 percent said they had problems with cars, trucks and other vehicular traffic.

The degree of discontent with these problems had only a slight relation to the length of time one had to wait to cross an intersection, or the length of time one was given to cross, or the volume of vehicular traffic. As many as 80 to 87 percent said they did not experience these difficulties at all.

Relatively few pedestrians expressed emphatic pleasure or displeasure of any kind at specific elements of the walking environment.

-- 68 percent said they were pleased by "nothing in particular" about the walking environment. (31 percent expressed pleasure with trees and flowers, 22 percent with general appearance, 20 percent with cleanliness, 11 percent with benches, and 11 percent with shelter.)

-- 53 percent said they were displeased by "nothing in particular." (26 percent expressed displeasure with noise, 14 percent with dirt or litter, and 11 percent with air pollution.)

Few pedestrians expressed a strong response to either comfortable or uncomfortable elements of the walking environment:

-- 58 percent said they found "nothing in particular" that was comfortable about the pedestrian environment. (24 percent said they were comfortable with uncrowded sidewalks, 15 percent with smooth, level walking surfaces, 11 percent with unobstructed walkways.)

-- 70 percent said they found "nothing in particular" that was uncomfortable with existing conditions.

As many as 59 percent of the pedestrians surveyed said they chose to walk rather than ride a car, bus or other vehicle because their walking trip was "too short" to justify riding. Pleasure, comfort and convenience appears to have had little to do with their choice to walk. They walked because walking was the only reasonable way to travel short distances. Their conscious, stated interests seemed to be relatively unimportant in their choice.

The unconcerned, passive attitude that pedestrians express toward the walking environment stems from the instinctive, almost subconscious activity of walking itself. For the most part, pedestrians are concentrating on other thoughts while walking -- items in shop windows, personal problems, what they will do when they reach their destination -- and not on the immediate stimuli of the walking environment. Only when environmental stimuli strongly influence pedestrians positively or negatively do they become consciously aware of their pedestrian surroundings.

Findings in Support of Second Conclusion

Pedestrians chose to walk in locations that conformed to the primary purpose of their trip, even when their ultimate destination did not require them to do so:

-- At 10th and K Streets in Sacramento, a predominantly retail/commercial area, 35 percent of the pedestrians were on shopping trips.

-- At 21st and L Streets in Sacramento, a predominantly financial/business area, 33 percent were on work trips and 20 percent were on personal business.

-- At Ninth and I in Sacramento, a predominantly municipal area, 36 percent were on personal business trips.

Pedestrians of different ages chose to walk in areas where others of their age group tended to converge:

-- At Ninth and I in Sacramento, a larger proportion of elderly pedestrians (14 percent 65 and older) and a higher average age (28 years) were observed than at any other locations examined.

-- At 13th and O in Lincoln, the largest proportion of pedestrians aged 15-24 (48 percent) was observed.

Pedestrians of different trip purposes walked characteristic distances:

-- Walks to school averaged 7.5 blocks; and 35 percent were longer than 10 blocks.

-- Social/recreational walks averaged 5.7 blocks; and 16 percent were longer than 10 blocks.

-- Walks to work averaged 5.2 blocks; 14 percent were longer than 10 blocks.

-- Shopping walks averaged 4.9 blocks; 33 percent were shorter than three blocks.

-- Personal business walks averaged 4.4 blocks; 42 percent were shorter than three blocks.

The pedestrians' trip purposes often determined whether they planned their trip in advance, and were therefore open to the influence of their environment on their choice of route:

-- Only seven percent of the pedestrians on work trips and 11 percent of those on personal business trips walked spontaneous routes. But 39 percent of those on social/recreational trips and 37 percent of those on shopping trips chose spontaneous routes.

Pedestrians' attitudes toward walking itself (as opposed to the walking environment) are generally very favorable and become increasingly favorable as they get older:

-- 81 percent said they liked to walk, and walk often or frequently. This positive attitude increased from 67 percent for pedestrians aged 15 and younger to 87 percent for those aged 65 and older. When faced with a choice between walking and riding over reasonably long distances, they chose walking for reasons of enjoyment (30 percent), convenience (21 percent) and exercise (21 percent).

Policy Implications

Taken in combination, these two conclusions have significant policy implications. They suggest that, although pedestrians do not articulate their responses to the walking environment, they nevertheless do respond behaviorally. When benches are provided, they sit on them. When parks are provided, they linger in them. When ramps are provided, they take advantage of them. The impact of such intangible amenities as colors, street lighting and interesting paving patterns cannot be measured, but they also affect pedestrian behavior positively.

The findings suggest that extremely offensive and inconvenient conditions at certain locations should be rectified. There is no excuse for inaction here. Just as important, they suggest that there is sufficient justification for upgrading the pedestrian environment even when it is not particularly offensive. Those who execute these improvements are not likely to have their efforts rewarded with praise, but they are likely to find people using them.

Beyond this is the question of raising the consciousness of pedestrians. We believe that more people are consciously aware of their surrounding today than they were some years ago. The emphasis given to the environment by the media and by public concern has caused more people to examine their environment and to make decisions about what pleases them and what displeases them.

Efforts to raise the consciousness of pedestrians require extensive and long-range efforts in urban planning, development and land-use management. An occasional curb ramp or additional tree will not provoke wild enthusiasm. But efforts to produce total pedestrian environments that are pleasant, safe and interesting to be in will, in time, bring people to the conscious realization that a good pedestrian environment enhances their well being.

I. INTRODUCTION

This report is the product of an extensive study of pedestrians and the environments in which they walk. The purpose of the study was to increase the rather sketchy knowledge that now exists about pedestrians' behavior and their needs so that accommodations to meet those needs can be designed and implemented.

We believe that this report largely fulfills that objective. It not only sheds new light on how pedestrians behave and why they behave as they do, it also proposes criteria for designing to accommodate their behavior.

Though we had hoped also to produce specific indicators showing the adequacy of pedestrian accommodations to speed, safety, comfort, and convenience, this proved to be impossible -- at least within the context of our methodology. We discovered, instead, that indicators bear little relevance to the pedestrian experience. They can be misleading and inconsistent with actual pedestrian behavior.

Designing for the pedestrian, we found, is entirely different from designing to accommodate vehicles. System capacity, speed, traffic flow and other criteria that help produce good accommodations for vehicles are virtually inapplicable to pedestrian behavior. This report explains why that is so and presents criteria that we believe do have relevance to the design of accommodations that truly serve the needs of pedestrians.

II. METHODOLOGY

We used three techniques to gather information about pedestrian behavior and perception:

1. Individual pedestrians were polled in large numbers at selected survey sites.

2. Individual pedestrians were observed as they were being followed.

3. Photography was used to supplement the first two approaches.

The survey poll revealed the kinds of behavior and perception that groups of pedestrians engage in, such as the length of walks by elderly people as contrasted with young people. The tracking, observation and photography revealed the conditions that influence pedestrians in certain circumstances, such as a sidewalk obstruction which diverts a person a slightly altered route. The combination of photography, observation and survey of pedestrians documented variable conditions such as trip densities at different locations and at different times of day.

Selection of Cities

We conducted surveys and observation in downtown Washington, D. C., Lincoln, Nebraska, and Sacramento, California. We observed and photographed pedestrians in downtown Cincinnati, Ohio, and Boston, Massachusetts. The following criteria determined our selection of these cities:

1. Population range encompassing cities of more than one million, 500,000 to one million and less than 500,000.

2. A range of differences -- ethnic, age, income level -- among pedestrians in downtown areas.

3. Various land-use patterns; high versus low density.

4. Differences in laws governing pedestrian movements.

5. Differences in facilities available to pedestrians, including grade-separated pedestrian pathways.

6. Recent traffic improvements offering pertinent areas of pedestrian interaction with vehicular traffic.

7. Our knowledge of each city based on our own experience through other projects.

(The characteristics of the selected cities are shown in Appendix A.)

Selection of Survey Sites

We decided that our study would be more representative if the attitudes and perceptions of pedestrians were surveyed in a variety of street environments in different cities, as well as in and around pedestrian malls and major activity centers. We chose five types of facilities that fulfilled our criteria.

1. Public transit stops (to study pedestrian interaction with bus stops).

2. Intersections with traffic controls for both pedestrians and vehicles.

3. Traffic-signal-controlled intersections with one-way vehicular traffic.

4. Major activity centers (hospitals, schools, cultural centers, office employment areas, regional and local shopping areas).

5. Special or interesting facilities (pedestrian malls, plazas, special bus facilities).

Selection of Observation Sites

Lincoln

The 15th Street Mall was created by closing the street to make a visual connection between the University of Nebraska and the State Capitol. The design is formal and uninviting. There are no entries along the mall and nothing provided within it that could act as an activity generator.

Sacramento

Twelfth Street is an old state highway whose traffic has been diverted somewhat by a newer highway. Buildings along the section that we studied (between J and F Streets) rarely rise above two or three stories, and they are interrupted frequently by large empty spaces and parking lots. There are several old shops carrying low priced goods, an old Safeway, and an old hotel and bar. Rummage and Goodwill sales are frequent attractions.

The Sacramento Mall is the spine of the main shopping district in downtown Sacramento. Built with a heavy investment in fountains and landcaping, it runs along what was previously a street right-of-way. An open-air bus traverses the mall. The shops and office along the mall create a varied collage of uses. The design does not accommodate independent spaces such as culs-de-sac and dead-ends.

Sacramento Plaza is an old block-square park with sidewalks around its perimeter. Paths bisect the park's circular open spaces but do not cross it diagonally, thus discouraging pedestrian cross traffic. This internal isolation is enhanced by the fact that there are benches and card and chess tables within the open spaces. The pleasant atmosphere provides relief (trees, bushes and benches), and activity (chess, checkers, cards).

Cincinnati

Fountain Square in the heart of downtown Cincinnati is flanked by offices on two sides and by commercial buildings on the other. It covers an underground garage and has access to a second-level skywalk that links several office buildings, a department store, two hotels, two peripheral parking lots and a convention center. It has many different kinds of spaces off the major circulation path, yet it seems open and safe. It provides many attractive and useful choices and amenities, including benches, walls designed for sitting, ramps for the handicapped, trees, stands and mobile units with information or displays.

Government Square was created by recessing the building line along Fifth Street and widening it between Walnut and Main, serving as a bus collection area. A kiosk serves as an information center. Along one sidewalk are benches and an arcade for people waiting for buses. Facing these are a federal office building, commercial structures and a parking lot.

Sixth and Walnut is surrounded by offices and shops half a block from Fountain Square. Elderly men sit on a wall at this corner. Across the street and down half a block is Midtown Apartments for the elderly. A carryout ice cream stand half a block from the sitting wall attracts teenagers to the area.

The Cincinnati Skywalk, a 1970 renewal project, is a system of bridges, covered arcades and second-story sidewalks connected to the street by escalators. One rather austere-looking segment that connects office buildings across Main Street is not heavily used. But another segment, which overlooks Fountain Square and connects office buildings and a large department store, attracts large numbers.

Fourth Street is a commercial strip containing some of Cincinnati's most exclusive stores. The site we chose was in front of Gittings Jenny, an exclusive women's store. There is some landscaping, but no benches or other special amenities except the luxurious facade treatments of the stores.

Race Street is downtown Cincinnati's major shopping street. Here we chose a site in front of Shillitos department store, a major retail facility. A major bus stop is in front of the store. Several improvements have been made by Shillitos along the sidewalk. Unlike Cincinnati's

skywalk, the improvements are simple and direct responses to the comfort needs of users. Awnings shade and protect walkers from the rain. Heaters are installed under the awnings for cold weather. Benches are provided for those waiting for the bus. They are backed up against the building, allowing good vision of oncoming buses. They do not block traffic or views of merchandise in the store windows.

Boston

Paul Revere Mall is a paved park in the North End heavily used by local residents and tourists. It is flanked by commercial Hanover Street and historic Old North Church. The Freedom Trail, marked by a painted line leading people to historic spots in Boston, comes down Hanover and through the mall to the church.

Government Square surrounds Boston City Hall, the focal point of the 60-acre Government Center area. The square is extremely large and almost completely paved with brick and concrete. There are few trees or seating areas but many steps between changes in level.

Boston Common borders the city's commercial area as well as residential Beacon Hill and the historic State House. A tree-and-grass remnant of historic Boston, it is something of a green oasis in the heart of the city. We compared the noontime uses of the Common with those of Government Square. Both are surrounded by high-density development and have subway exits within their boundaries.

The State-H.E.W. Complex is designed to have an internal pedestrian area. It is only partially completed. The wall surfaces of the building are highly textured concrete and the organization of many of the public spaces is somewhat curvilinear. We went to look at the complex because it had won some acclaim for its design. It is a powerful and artful statement, but it is extremely uncomfortable for its users.

The Survey Instrument

The survey poll examined pedestrian behavior and perception in five categories: (1) the trip itself, (2) the character of the walking path, (3) traffic controls, (4) the quality of the environment and (5) personal data about the respondent. The 42 survey questions included "yes, no," multiple-choice and scalar evaluation questions. (A copy of the survey and the aggregation of all responses to the poll in Lincoln and Sacramento are shown in Appendix B.)

Respondent pedestrians were randomly selected at each survey site. However, interviewers attempted to obtain a sample of pedestrians roughly representative of the total population in each city. This selection method was fairly successful in achieving city-wide pedestrian samples which were representative of various age, race and sex groups in the total population. However, because the incidence of these groups differed between locations within each city, the sample of pedestrians at each intersection is representative of local pedestrians rather than of total populations.

We pretested the survey in Washington, D.C., to gauge the mechanics of recording responses, to evaluate pedestrian understanding of the questionnaire, and to estimate results of the survey poll. Findings of the survey poll pretest are shown in Appendix C.)

We completed 485 on-street pedestrian interviews in Sacramento and 400 in Lincoln. Interviews were conducted between August 13 and 17, 1973. The polls were taken between 7 a.m. and 7 p.m., thus covering all peak and off-peak hours. The total interview sample adequately represented age, sex and race in proportion to total population in both Sacramento and Lincoln. (A detailed description of the survey sample appears in Appendix D.)

Observation Techniques

Following our surveys of pedestrians in Washington, Lincoln and Sacramento, observation and photography were done in these cities and in Cincinnati and Boston. Our observation techniques focused on three main tasks: (1) the tracking of walking routes identified by respondents to the questionnaire, (2) time-lapse photography of pedestrians at peak hours at selected locations and (3) photography and observation of individual pedestrian behavior and the dynamics of pedestrian interaction.

For our tracking of pedestrians in Lincoln and Sacramento we used a local street map attached to every survey questionnaire. Each respondent was asked to mark his or her walking route on the map, and researchers followed the marked route to identify features of the environment that influenced the pedestrian's movements. In Cincinnati and Boston we followed individuals from a short distance along their entire walking route.

Our tracking of pedestrian walking routes was a productive way of relating survey responses (subjective measures of behavior and perception) to observations (objective measures). It revealed specific types of behavior and perception and reasons for route selection that did not surface from the survey.

III. FINDINGS

We were baffled at first by the discrepancies between the behavior of pedestrians whom we interviewed and the reasons they gave for their behavior. Often the reason given for walking a particular route seemed clearly in conflict with the actual route walked.

An old man said he liked trees and flowers but took the least-landscaped route possible -- and he didn't stop along the way. A commuter walked 22 blocks in a big circle around town when he could have made the trip in six blocks. His stated reason for choosing that route was "quickest." A woman said she took the quickest route, but there is no quickest route in a grid of streets and she clearly picked the best-landscaped streets.

After walking all the routes drawn by respondents on the survey maps (except the short, straight ones) we concluded that there was clearly a consistency to each pedestrian's route and a pattern linking the kind of walker to the route he or she chose. We felt, for example, that elderly people were walking on "old folks" streets and middle-class adults (18-45) on nicely landscaped streets.

We concluded that by classifying streets as "old folks," landscaped, etc., we could predict who would walk there. We later tested this hypothesis in the same area of Washington, D.C. that had been used for the survey pretest. The discrepancy between actual walking trips and the statements of pedestrians led us to believe that walking behavior is subconscious or practiced at a "second level of consciousness."

Walkers definitely chose according to some internal reasons, but they seldom could describe what their real reasons were. Almost all said "quickest" as their reason for choosing a path. Often there was no significantly quickest route, either in time or distance, for the four- or five-block average trip.

We concluded that, unlike drivers, whose attention must be focused on the act itself, walkers are free to look about, talk to friends and engage in activities other than traveling. For this reason, analyzing the behavior of walkers is different from analyzing the primarily conscious behavior of drivers and other travelers.

As a result of our discovery, we began to rely heavily on observation to clarify what seemed to be hazy data from our questionnaire. Because we did not have an extensive number of questionnaire maps to follow, we came up with the idea of simply following walkers who seemed to fit a category we were interested in. It was easy to wait outside a school for a child walker or a hotel for a tourist walker. By using this technique we found again that there was a consistency to each walk. Children, for example, walked adventurous and spontaneous routes.

This led us to formulate basic concepts to explain the walking behavior we had observed. First we said that the internal reasons people had for choosing which paths they walked seemed to be based on a wide range of factors, including trip purpose, mood and the desire to be with people like oneself. The simplest term that seemed to encompass all the facets of these internal rules was "comfort." We used this term because psychological comfort seemed to be more important than efficiency or any other general characteristics.

We observed that people with similar socioeconomic characteristics and purposes seemed often to have the same kinds of "comfort factors." Their behavior was consistent. Elderly pedestrians walked the routes of other elderly people, middle-class woman shoppers walked clean and safe shopping routes.

There seemed to be three basic subgroups of comfort factors: psychological, functional and physical:

Psychological factors seemed most important. In our view they included such elements as fear of dissimilar people, the desire to be with one's own kind, the fit of a place with one's self-image, territoriality, mood, etc.

Functional factors often seemed to take second place to psychological comfort in determining route choice. They included, in our view, such elements as trip purpose (the need of shoppers to go to shops and to compare one shop with another) and the time or desired efficiency of a walk. When a trip has several purposes, such as shopping, socializing and exercise, trip purpose becomes the prime functional comfort factor.

Physical factors seemed least important, though they obviously played a part in the choice of routes. They included the desire to walk in the shade on a hot day, the difficulty elderly people have in stepping up on curbs -- all the things related to physical comfort.

We felt that any walking environment consists of a vast array of images which people perceive as comfortable or uncomfortable for them to walk. Because people are selectively perceptive, each person reads these messages in hhis or her own way.

This explains why we saw consistency in each walk but couldn't typify the streets. Each street is more or less comfortable for a wide variety of walkers. When we walked a mapped route or tracked someone, we saw their route as a consistent entity because we saw it through a specific walker's eyes. But when we tried to typify streets we saw too many conflicting messages to classify them as elderly, shopper, business or any other single-purpose type.

Because we had developed an intuitive feel for the comfort of each group we had tracked, we felt we could predict who would be walking any

given path after briefly observing the people on the path and the surrounding land uses. We thought we could evaluate a place through each group's eyes and then predict what types of walkers would predominate at any location.

We conducted five tests in Cincinnati to see if we were right. In each place we counted the number of people by type who crossed an imaginary line across the path we were interested in. Our prediction was right in every test. When we predicted that a place would have a good number of elderly people, for example, it did have a very high percentage compared to other sites.

We felt that we could develop a series of networks for each type of walker and that these networks would overlap. We saw them as networks because, after tracking people, we found that many of the same type walked similar paths. These paths were often consistent with the land-use pattern of a given area of the city and seemed to have evolved as comfortable paths for various users. No place is good for the elderly, for example, unless it is located along a reasonably easy route. Walking is a continuous, not a static, experience.

We went to Boston next to test our ideas in a city with a subway, streets that are not on a grid, and downtown residential areas. We also wanted to test our ideas against planners in the Boston area who were working on pedestrian problems. Our hypothesis was validated -- or at least supported. This led us to believe that we could begin to write design criteria for good (or "comfortable") pedestrian pathways in dense urban areas.

Influence of Location on Pedestrian Behavior and Perception

Location has a significant influence on pedestrian behavior and perception. The purpose of the walking trip, pedestrian contentment with traffic control and their reaction to environmental conditions are all affected by the location in which pedestrians find themselves. In addition, location plays an important role in attracting different age groups. (Table 1 summarizes the influence of selected location on pedestrians in Lincoln and Sacramento.)

Trip Purpose: The effect of the location on the purpose of the walking trip is partly determined by local land uses and building types. The existence of a homogeneous, predominant land use at a specific location (such as 16th and K Streets in Lincoln) will generate a single prevailing trip purpose and the combination of a few mixed land uses (such as 10th and K Streets in Sacramento) will generate two or more prevailing trip purposes. (See Table 2.)

At 16th and K Streets in Lincoln the predominant land use is employment at the State Capitol and two large insurance companies. Thus the predominant trip purpose is journey to work (50 percent). At 10th and K

Table 1

Influence of Location on Pedestrian Behavior and Perception

PEDESTRIAN LOCATION and its influence on behavior and perception	WALKING TRIP PURPOSE	AGE OF PEDESTRIANS	CONTENTMENT WITH TRAFFIC CONTROLS	PERCEPTION OF PLEASURE IN THE WALKING ENVIRONMENT
10th & K STREETS Sacramento. K Street pedestrian shopping mall; pleasantly landscaped, predominantly retail/commercial; offices nearby. Five lanes of one-way traffic on Tenth Street; 52 ft. road width; 33-second steady "don't walk" signal, 17-second "walk" and flashing "don't walk" signal	Shopping and social/recreational trips predominate; some work trips.	Larger than average proportion of pedestrians younger than 24 and especially younger than 15.	Minimal discontent with time necessary to wait before crossing intersection, or with traffic. Significant discontent with time allowed to cross intersection.	Trees and flowers, shops for browsing, general appearance, cleanliness and benches for resting are pleasant.
21st & L STREETS Sacramento. Financial district; residences nearby; bus stop and auto parking garage on L Street. 48 ft. road widths; 28 seconds steady "don't walk" signal, 22 second "walk" and flashing "don't walk" signal.	Work, personal business and social/recreational trips predominate.	Slightly more than average proportion of elderly pedestrians.	Greater than average discontent with time allowed to cross intersection, or with traffic.	Noise is unpleasant.

Table 1 (continued)

PEDESTRIAN LOCATION and its influence on behavior and perception	WALKING TRIP PURPOSE	AGE OF PEDESTRIANS	CONTENTMENT WITH TRAFFIC CONTROLS	PERCEPTION OF PLEASURE IN THE WALKING ENVIRONMENT
NINTH & I STREETS, Sacramento. City Hall, library, post office, 52 ft. road widths; pedestrians obey vehicle stop lights, 25-second red light and 22-second green and yellow light.	Personal business, work and social/ recreational trips predominate.	More than average proportion of elderly pedestrians.	Little discontent with traffic controls.	Dirt, litter and air pollution are unpleasant.
13th & O STREETS, Lincoln. Lincoln's major intersection; retail/commercial and banking with office space above street level. Four and five lane two-way traffic; 60 ft. road widths; 30-second steady "don't walk" signal, 30-second "walk" and flashing "don't walk" signal.	Shopping, work and personal business trips predominate.	Larger than average proportion of pedestrians 15-24 years old.	Moderate discontent with time necessary to wait before crossing.	Shops for browsing, benches for resting and shelter from weather are pleasant. Noise is unpleasant.
16th & K STREETS, Lincoln. State capitol, insurance offices and university campus nearby; attractively landscaped. Four and five lanes of traffic, 60 ft. road widths, 33 second steady "don't walk" signal, 33 seconds "walk" and flashing "don't walk" signal.	Work and personal business trips predominate; more than average school trips.	Larger than average proportion of pedestrians 15-24 years old.	Moderate discontent with time necessary to wait before crossing.	Trees and flowers, general appearance and cleanliness are pleasant.

Streets in Sacramento the predominant land use is retail shopping on the pleasantly landscaped K Street pedestrian mall. Here the two prevailing walking trip purposes are shopping (35 percent) and socializing (28 percent). The location of state government and other offices on adjacent L Street suggests that the high proportion of social trips are made by nearby office employees destined for lunch and other noontime social/recreational activities.

Table 2

Percent Distribution of Pedestrians by Purpose and Location

Location	Number of Ped. Surveyed	Trip Purpose						
		Work	Shopping	Personal Business	Social	School	Other	Total
Sacramento, CA								
10th & K	257	21%	35%	11%	28%	0%	5%	100%
21st & L	113	33	6	20	27	6	8	100
Ninth & I	98	25	14	36	20	1	4	100
Lincoln, Neb.								
13th & O	279	24	42	16	13	1	4	100
16th & K	109	50	9	10	18	7	6	100
All Locations	856	27%	28%	16%	21%	3%	5%	100%
No Responses	29							
Total	885							

Contentment with Traffic Control: Pedestrians are sensitive to the delays caused by traffic control signals at street intersections. (See Table 3.) At 13th and O Streets, and at 16th and K Streets in Lincoln, where pedestrians had to wait 30 and 33 seconds, respectively, at steady "don't walk" signals, greater proportions said the wait was "too long" than at any other location. But at Ninth and I Streets in Sacramento, where the steady "don't walk" signal lasts 25 seconds, only four percent expressed discontent. Yet on the K Street pedestrian mall in Sacramento, where the wait is 33 second, only four percent expressed discontent. (Apparently, the environmental quality of the mall attracts pedestrians' attention and reduces their discontent.)

Table 3

Pedestrian Contentment with Traffic Controls at Five Intersections

Location [1]	Number of peds. surveyed [2]	Had to wait "too long" before crossing intersection			Had "enough time to cross" intersection				Said pedestrian crossing was "too crowded" for comfort		
		Yes	No	Length of steady "don't walk" signal	Yes	No	Length of "walk" and flashing "don't walk" signal	Width of Street	Yes	No	No. of peds. per intersection crossing
Sacramento											
10th & K (10th only)	185	4%	96%	33 sec.	73%	27%	17 sec.	52 ft.	6%	94%	21
21st & L	73	14	86	28 sec.	78	22	22 sec.	48 ft.	4	96	2
Ninth & I [3]	74	4	96	25 sec.	96	4	25 sec.	52 ft.	2	98	6
Lincoln, Neb.											
13th & O	232	16	84	30 sec.	82	18	30 sec.	60 ft.	9	91	10
16th & K	90	19	81	33 sec.	81	19	33 sec.	60 ft.	3	97	3
All locations	654	13%	87%	--	80%	20%	--	--	6%	94%	--
No Response	231										
Total	885										

1/ Street widths and signal phase times pertain to both streets of the subject intersection unless noted otherwise in paranthesis.

2/ All pedestrians surveyed after crossing intersection.

3/ "Walk/Don't Walk" signals do not exist at this location, pedestrian crossings are controlled by vehicle stop lights.

Table 3 (continued)

Pedestrian Contentment with Traffic Controls at Five Intersections

Location	Had "problem with cars and trucks"		Traffic Conditions	Total Peds. Problems with Traffic Control*
	Yes	No		
Sacramento				
10th & K	7%	93%	No vehicles on K St. Ped. Mall. Five lanes one-way traffic on 10th St. (380 veh/hour average)	39%
21st & L	27	73	Four lanes two-way traffic on 21st St. Three lanes one-way traffic on L St. (700 veh/hour average)	72%
Ninth & I	14	86	Three lanes one-way traffic on both Ninth and I Sts. (780 veh/hour average)	24%
Lincoln				
13th & O	16	84	Five lanes two-way traffic on I St. Four lanes one-way traffic on 13th St. (735 veh/hour average)	59%
16th & K	12	88	Five lanes one-way traffic on 16th St. Four lanes one-way traffic on K St. (600 veh/hour average)	53%
All locations	14%	86%	--	53%

* Frances M. Carp suggests that the four percentages of pedestrians with "a problem" must be summed to indicate the proportion of pedestrians at a specific location with "any problem" as defined in this study. This is approximation, as no doubt some pedestrians are problem prone and experience multiple risks at any location, while others have few. It is important, however, to point out that 14-20% of pedestrians reporting each of four types of problems at a specific location is the minimum proportion possible of discontented pedestrians, while the 24-72% summation of the four types of problems is a maximum proportion possible of discontented pedestrians. (Memorandum undated.)

Pedestrians are also sensitive to the amount of time allowed for crossing intersections. At 10th and K Streets in Sacramento, where the "walk" and flashing "don't walk" signals give pedestrians only 17 seconds to cross the 52-foot roadway, 27 percent expressed discontent. Yet at Ninth and I Streets in Sacramento, where pedestrians are given 25 seconds to cross the 52-foot roadway, only four percent registered dissatisfaction.

The complexity and intensity of traffic also affects pedestrian contentment. Twenty-first and L Streets in Sacramento is traversed by some 700 vehicles per hour. Twenty-first Street has four lanes of two-way traffic with two parking lanes, and L Street has three lanes of one-way traffic with two parking lanes. Here the largest proportion of pedestrians reported a problem with cars or trucks. In contrast traffic flow at 10th and K Streets in Sacramento is relatively uncomplicated. Walkers from the pedestrian mall cross one-way traffic on 10th Street, where no turns are possible. Only 380 vehicles traverse the intersection per hour. Here, only seven percent reported problems with vehicles.

Precise Indicators of Satisfaction: Precise indicators of the adequacy of pedestrian accommodations to speed, safety, comfort and convenience were found to be inconsistent with actual pedestrian behavior, and inconclusive and misleading when applied to actual pedestrian experience. An attempt was made to statistically correlate stated pedestrian satisfaction with objective levels of crowding, required length of waiting time at intersection crossings, and allowed length of crossing time at intersections. The correlation of stated pedestrian satisfaction with objective measures of these conditions was found to be statistically insignificant at reliable levels of confidence.

Table 4 shows the statements of pedestrian satisfaction as reported in Table 3 and their correlation with objective measures of conditions. The correlation coefficient (r) is shown for each attempted correlation. Coefficients of .339, .349 and .508, respectively, are too low to be reliable, and indicate that pedestrians were not reporting their satisfaction consistently with objective measures of conditions. This result suggests that precise indicators of pedestrian conditions such as waiting time, crossing time and crowding conditions are poor explanations of pedestrian behavior.

Table 4

Attempted Correlation of Stated Pedestrian Satisfaction and Objective Measures of Condition

Stated Pedestrian Satisfaction	Objective Measure of Conditions	Correlation Coefficient (r)
Had to wait "too long" before crossing intersection, as percent of all respondents	Length of steady "don't walk" signal in seconds	.339
Had "enough time to cross" intersection, as percent of all respondents	Length of "walk" and flashing "don't walk" signal in seconds	.349
Unpleasant because "too crowded", as percent of all respondents	Number of pedestrians per intersection crossing	.508

The Walking Environment: The majority of pedestrians say they are neither pleased nor displeased by the environment in which they walk, but there is a considerable difference from one location to another in the percentage of those who do express pleasure or displeasure. (See Table 5.)

At 16th and K Streets in Lincoln, where landscaped grounds surround the State Capitol, 44 percent said they were pleased by trees and flowers, 37 percent by the general appearance and 32 percent by the cleanliness of their walking environment. But at 13th and O Streets in Lincoln, a busy intersection where there are few trees and little landscaping, we recorded the lowest level of response to these features. And a larger proportion of the pedestrians here said they were displeased by noise.

Pedestrian Age: Different walking environments attract pedestrians of different age groups. At Ninth and I Streets in Sacramento, where the City Hall and a library are situated, a larger proportion of elderly pedestrians and a higher average pedestrian age was observed than at any other intersection examined. (See Table 6.) The proportion was large even considering that Sacramento has a proportionately larger elderly population than Lincoln. (See Appendix D.) At 13th and O Streets in Lincoln, a retail area, a larger proportion of young pedestrians aged 15-24 were observed than at any other intersection.

Table 5

Percent Distribution of Pedestrians' Perception of Pleasant/Unpleasant Walking Environment by Location *

Location	Number of peds. surveyed	Pleasant Elements: Trees & Flowers	General Appearance	Clean-liness	Shops for browsing	Benches	Shelter	Nothing in Particular
Lincoln, Neb.								
13th & O	280	19%	17%	18%	25%	10%	15%	66%
16th & K	108	44	37	32	6	4	6	71
Sacramento, CA								
21st & L	113	34	14	13	5	2	11	56
10th & K	257	38	29	23	35	21	10	77
Ninth & I	100	32	11	10	9	9	11	62
All Locations	858	31%	22%	20%	21%	11%	11%	68%
No Response	27							
Total	885							

	Number of peds. surveyed	Unpleasant Elements: Noise	Dirt & Litter	Air pollution	Nothing in Particular
Lincoln, Neb.					
13th & O	280	35%	16%	5%	54%
16th & K	108	25	5	7	42
Sacramento, CA					
21st & L	113	32	12	14	54
10th & K	257	18	14	13	54
Ninth & I	100	21	23	20	59
All Locations	858	26%	14%	11%	53%
No Response	27				
Total	885				

* Totals do not equal 100% because respondents were not limited to one response.

Table 6

Percent Distribution of Pedestrians by Age Group and Location

Location	Total Peds. Surveyed	Age: Younger than 15	15-24	25-44	45-64	65+	Total	Average Age
Sacramento, CA								
10th & K	260	5%	38%	29%	18%	10%	100%	24 yrs.
21st & L	112	1	31	36	21	11	100	27 yrs.
Ninth & I	99	0	33	35	18	14	100	28 yrs.
Lincoln, Neb.								
13th & O	242	4	48	23	18	7	100	23 yrs.
16th & K	157	3	47	23	19	8	100	24 yrs.
All Locations	870	3%	40%	28%	19%	10%	100%	25 yrs.
No Response	15							
Total	885							

Effects of Walking Trip Purpose on Pedestrian Behavior and Perception

The purpose of a pedestrian's walk partially influences the length of his walk, the time of day, his planning and choice of route, his attitude toward and motivation for walking and, to some extent, his pleasure and personal comfort in the walking environment. A person on a walking trip to work, for example, exhibits different behavior and perceptions than on a shopping or social/recreational walk. (Table 7 summarizes the influence of walking trip purpose on pedestrian behavior and perception.)

Trip Length: The average length of all walks surveyed by this study was 5.1 blocks*, and a considerable proportion (21 percent) were longer than eight blocks. (See Table 8 and Graph 1.) The longest average walks were taken by pedestrians on work trips, social/recreational trips and school trips. Some of these were meandering routes for the purpose of getting fresh air or going out of the way to talk with a friend or visit a social or recreational facility.

* Trip length is reported in blocks because pedestrians immediately recognize this unit of measure and can use it to estimate the length of their walking trip. In Sacramento the length of blocks is 400 ft., and in Lincoln 300 ft. Thus an approximateion of block length in this study would be 350 ft.

Table 7

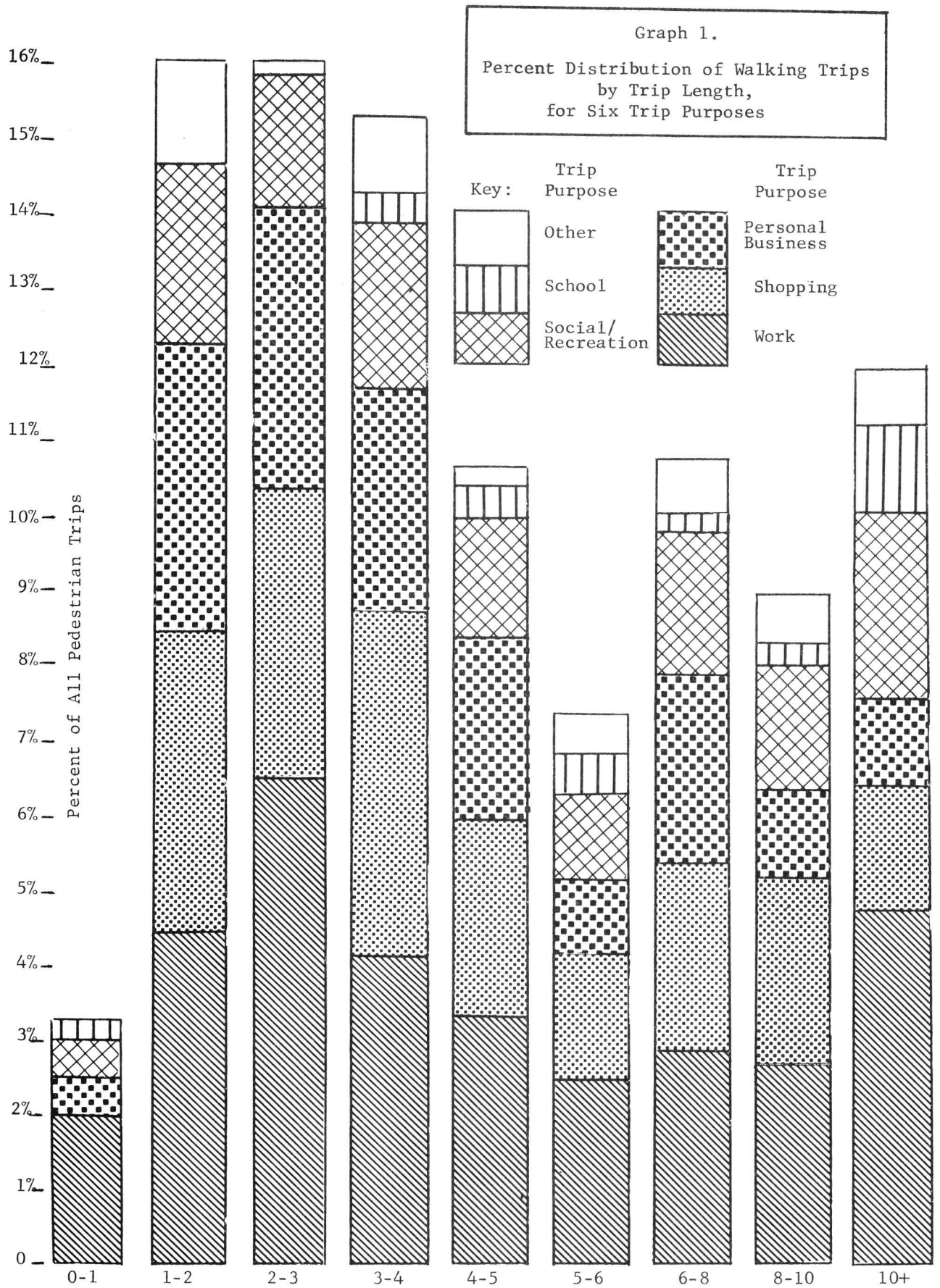
Influence of Walking Trip Purpose on Pedestrian Behavior and Perception

TRIP PURPOSE and its influence on pedestrian behavior and perception	WALKING TRIP LENGTH	TIME OF DAY OF WALKING TRIP	PLANNING AND CHOICE OF ROUTE	PEDESTRIAN MOTIVATION AND ATTITUDE FOR WALKING	PERCEPTION OF PERSONAL COMFORT AND PLEASURE
WORK	5.2 blocks average; 40% less than 3 blocks	Sharpest peak walking period 7:30-9:30 a.m., second peak period 3:30-6:00 p.m.	Predominantly planned walking routes chosen for shortest walk.	Alternate modes available; walkers to work perceive shorter trip on foot than in vehicle.	Unobstructed and uncrowded walkway comfortable.
SHOPPING	4.9 blocks average; 33% less than 3 blocks	Peak period 1:30-3:30 p.m., large proportions throughout the day.	Larger than average proportion of unplanned route, some without chosen destination. Route chosen for shops and browsing.	Unavailability of public transit; walking more convenient than alternatives	Shops for browsing and benches for resting enjoyable.
PERSONAL BUSINESS	4.4 blocks 42% less than 3 blocks	Relatively constant proportion throughout the day.	Predominantly planned walking routes chosen for shortest walk.	Trip too short for alternative modes.	
SOCIAL/ RECREATIONAL	5.7 blocks average; 40% longer than 6 blocks	Relatively constant proportion throughout the day	Largest proportion of unplanned routes, some without selected destinations.	Walk for enjoyment and exercise.	Trees/flowers, cleanliness and general appearance enjoyable.
SCHOOL	7.5 blocks average; 50% longer than 6 blocks	Peak periods 7:30-9:30 a.m. and 3:30-6:00 p.m.	--	Unavailability of automobile; walk for economy.	Uncrowded walkway and smooth walking surface comfortable. Trees/flowers and general appearance enjoyable.

Table 8

Percent Distribution of Walking Trip Lengths by Trip Purpose

Trip Purpose	Number of peds. surveyed	Trip Length in Blocks										Average Walking Trip Lengths
		0-1	0-2	2-3	3-4	4-5	5-6	6-8	8-10	10+	Total	
Work	208	6%	14%	20%	12%	10%	8%	8%	8%	14%	100%	5.2 blocks
Shopping	148	0	17	16	20	12	7	10	11	7	100	4.9
Personal Business	120	3	20	19	16	12	5	13	6	6	100	4.4
Social Recreational	102	3	15	12	13	10	7	13	11	16	100	5.7
School	20	10	0	0	10	15	15	5	10	35	100	7.5
Other	32	0	28	3	19	3	9	16	9	13	100	5.3
All Purposes	630	3%	16%	16%	15%	11%	7%	11%	9%	12%	100%	5.1 blocks
No Responses	255											
Total	885											


Graph 1.
Percent Distribution of Walking Trips by Trip Length, for Six Trip Purposes
Key:
Trip Purpose
Other
School
Social/ Recreation
Trip Purpose
Personal Business
Shopping
Work
16%
15%
14%
13%
12%
11%
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0
Percent of All Pedestrian Trips
0-1
1-2
2-3
3-4
4-5
5-6
6-8
8-10
10+
Length of Walk in Blocks

The shorter average length of shopping trips and personal business trips results from the fact that a large number of people on these trips were coming from or going to their offices nearby. In contrast, walks to or from work or school were predominantly linked to homes that were farther from the destination.

Origin/Destination and Trip Length: The influence of trip purpose on trip length is more clearly understood by examining the distance between origin and destination. (See Table 9 and Graph 2.) The average walking trips beginning or ending at transit stops and parked autos were the shortest generated by an origin/destination points and partly explain the large proportion of short walking trips for all purposes. A large proportion of work, shopping, personal business, social, and other walking trips of 1 to 4 blocks included travel by car or bus. In Lincoln and Sacramento 80 to 85 percent of all commuters travel at least part way to work by private auto or taxi, and four to five percent by bus.* These commuters constituted the largest proportion of pedestrians on work trips who walked one to four blocks. The large proportion of work trips longer than 10 blocks is explained by the 5 to 10 percent of workers who walked exclusively to their jobs from their residences, and by those who walked great lengths for fresh air and exercise.

The much longer than average walks of pedestrians on school trips is explained by students' minimal use of automobiles or taxis. Students walking through central business districts are generally walking the entire length of their trip between residence and school, with a possible diversion in the downtown for social, shopping or other purposes.

Time of Day: The daily pattern of pedestrians on trips of all purposes shows two peak periods of walking: a sharp morning peak between 7:30 and 9:30 a.m., and a flat, lengthy afternoon peak period between 1:30 and 6 p.m. After 6 p.m., pedestrian activity diminishes sharply. (See Table 10 and Graph 3.)

The distribution of different walking trip purposes suggest which areas of the pedestrian network will be active at which times of day. Work trips during the morning peak period and late afternoon constitute the most intense peaking of any trip purpose. These time periods in the locations of office employment and along the lengthy routes from residential areas to office areas experience the most intense short-term use of the downtown pedestrian network. (The percentage of more pedestrians walking to work than from work results from the number of workers who stop at stores, bars, or other destinations on their evening return, and whose trips are not recorded as work trips.)

Within four to five blocks of stores, the mid-afternoon period between 1:30 and 3:30 is when the critical pedestrian load must be accommodated. Shopping trips constitute the predominant trip purpose during this period.

---

* Source: 1970 U.S. Census, General Social and Economic Characteristics. (See Appendix E.)

Table 9

Percent Distribution of Walking Trip Lengths by Origin/Destination Points

Origin/Destinations	Number of peds. surveyed	Walking Trip Length										Average Walking Trip Lengths
		0-1	1-2	2-3	3-4	4-5	5-6	6-8	8-10	10+	Total	
To or from:												
Office	208	5%	18%	18%	15%	12%	8%	9%	7%	8%	100%	4.5 blocks
Store	110	0	19	20	16	10	10	8	9	8	100	4.7
Residence	83	1	1	7	8	7	5	23	15	33	100	8.1
Auto	102	4	26	18	18	13	5	5	7	4	100	3.9
Transit Facility	64	5	16	16	16	11	12	9	9	6	100	4.6
School, Restaurant, Library, Museum, Park, Other	61	1	10	11	19	9	7	14	9	20	100	6.2
All Orgin Destinations	628	3%	16%	16%	15%	10%	8%	11%	9%	12%	100%	5.1 blocks
No response	257											
Total	885											

Graph 2.

Percent Distribution of Walking Trips
by Trip Length,
for Six Origin/Destinations

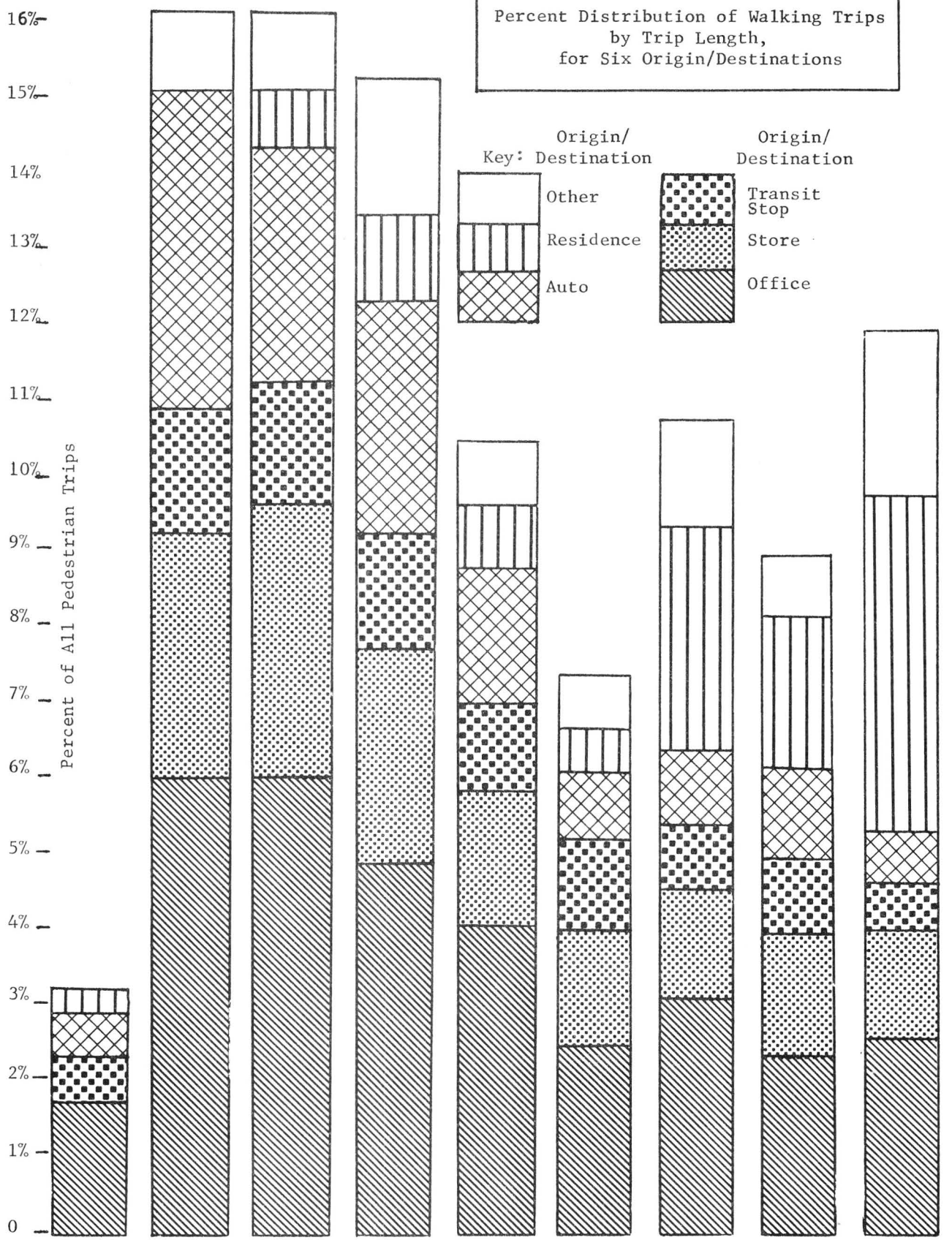
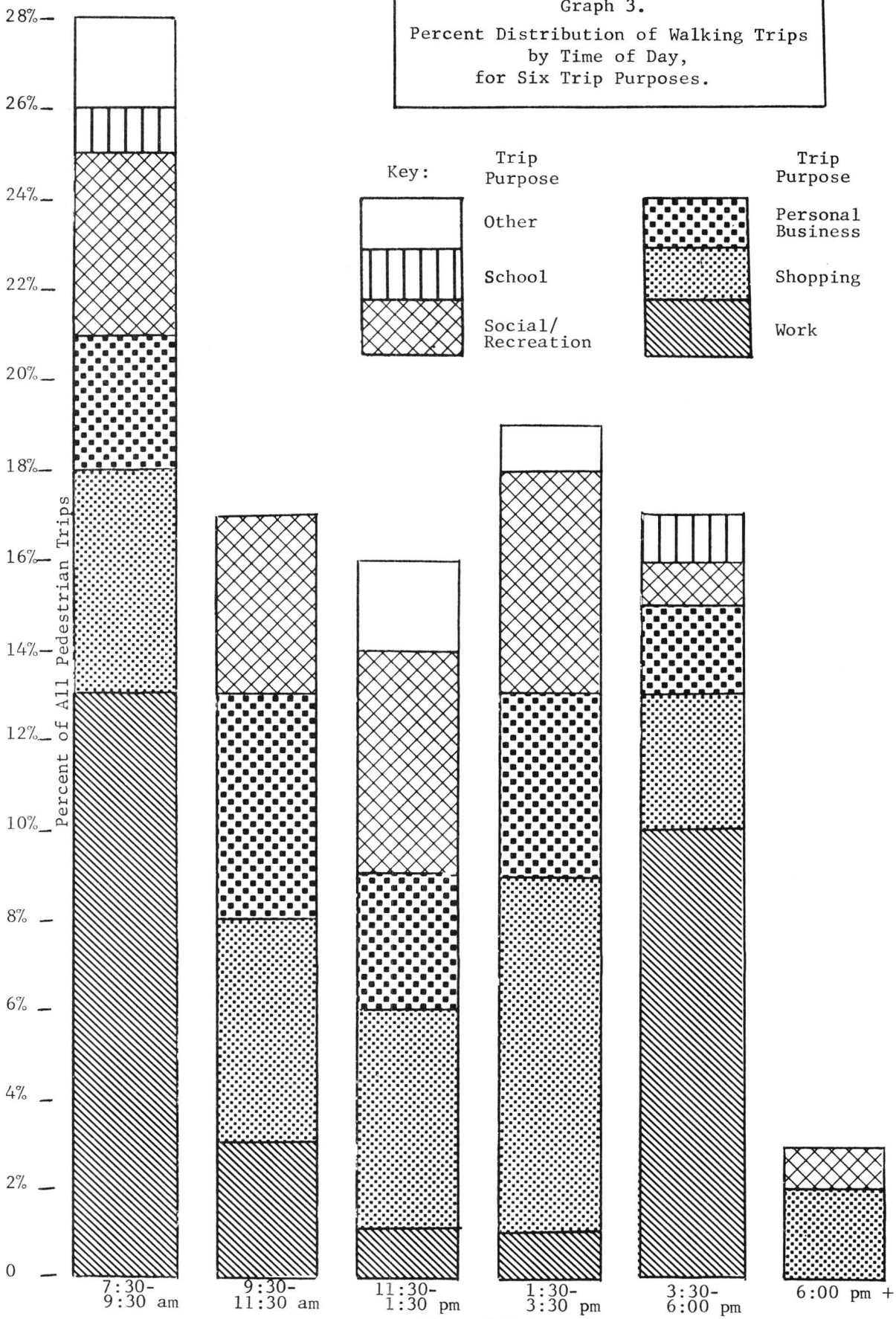


Table 10

Percent Distribution of Pedestrians by Trip Purpose and Time-of-day of Walking Trip

Trip Purpose	Number of Peds. surveyed	Time-of-Day 7:30-9:30 a.m.	9:30-11:30 a.m.	11:30-1:30 p.m.	1:30-3:30 p.m.	3:30-6:00 p.m.	6:00 p.m.+	Total
Work	234	13%	3%	1%	1%	9%	0%	27%
Shopping	237	5	5	5	8	3	2	28
Personal Business	142	3	5	3	4	2	0	21
Social/Recreational	177	4	4	5	5	1	1	19
School	20	1	0	0	0	1	0	2
Other	46	2	0	2	1	0	0	5
All Purposes	856	28%	17%	16%	19%	17%	3%	100%
No Response	29							
Total	895							

Graph 3.
Percent Distribution of Walking Trips
by Time of Day,
for Six Trip Purposes.



Planning and Choice of Route: The reason most often given by pedestrians for their choice of route is "shortest." (See Table 11.) Those on work trips are more influenced by this reason than all others except those on personal business trips, who walk only very short distances. Directness of route is important to workers, who are the most likely to plan their walking route in advance. Shopping and social/recreational pedestrians are less influenced in their choice of route by directness and shortness of the walk. Larger proportions of them are influenced by shops for browsing and scenery.

Motivation: Decisions that lead a person to choose walking as the mode of travel center on the availability of alternative modes and the relative advantages of walking. (See Table 12.) The largest proportion of pedestrians feel that no alternative mode exists because the trip is simply too short. This is particularly true of pedestrians on personal business trips.

Larger proportions of pedestrians on school trips and social/recreational trips identify lack of car as the reason they have no alternative mode of travel. Those on school trips are either too young for autos or can't afford them. Those on social/recreational trips do not have access to autos because their trip originates from a location to which they do not drive or because an available family auto is in use for another purpose.

A larger proportion of shopping pedestrians identify lack of public transit as the reason for no alternative mode. This is because shopping trips in downtown areas originate from other downtown locations, while public transit operates from suburban and residential areas to downtown.

For those who choose walking even when alternative modes are readily available, the motivation varies for different trip purposes. Larger proportions of pedestrians on social/recreational walks choose to walk because of the exercise and personal enjoyment. Larger proportions of shoppers choose to walk because it is convenient. And larger proportions of pedestrians on school and work trips choose to walk because it is economical.

Personal Comfort and Pleasure: Larger proportions of pedestrians on school trips find uncrowded sidewalks, smooth walking surfaces, level terrain, and unslippery surfaces to be elements of a comfortable walk. Pedestrians on work trips find an obstacle-free and uncrowded path to be comfortable. (See Table 13.)

Pedestrians on shopping trips indicate a positive response to the pleasantness of shops for browsing, benches for resting, and shelter from sun and rain in greater proportions than others. Walkers on social trips indicate greater than average pleasure at trees and flowers, cleanliness, and shops for browsing. School-trip pedestrians are most pleased by trees and flowers and general appearance.

Table 11

Planning and Choice of Route by Pedestrians of Six Trip Purposes

Trip Purpose	Number of Peds. Surveyed	Planning of Route: Planned Route to Destination	Planning of Route: No Planned Route and/or Destination
Work	236	93%	7%
Shopping	238	63	37
Social/Recreational	179	61	39
Personal Business	142	89	11
School *	25		
Other	46	78	22
All Purposes	866	77%	23%
No Response	19		
Total	885		

Trip Purpose	Reason for Choice of Route: Shortest	Shops for browsing	Scenery	Other or no reason	Total
Work	65%	5%	3%	27%	100%
Shopping	51	23	4	22	100
Social/Recreational	50	11	8	31	100
Personal Business	72	4	3	21	100
School *	56	0	8	36	100
Other	64	3	6	27	100
All Purposes	60%	10%	5%	25%	100%

* Insufficient school trip pedestrians indicated their planning of route to include this category of trip purpose.

Table 12

Availability of Alternative Modes of Travel and Motivation for Walking of Pedestrians on Six Trip Purposes

Trip Purpose	Number of peds. surveyed	Alternative Mode Unavailable Reason: No Auto	No Public Transit	Trip Too Short	Other	Total
Work	154	10%	8%	67%	15%	100%
Shopping	147	11	17	51	21	100
Social/Recreational	92	13	14	46	27	100
Personal Business	89	10	9	72	9	100
School	14	14	14	57	15	100
Other	28	11	4	61	24	100
All Purposes	524	11%	12%	59%	18%	100%

Trip Purpose	Number of peds. surveyed	Alternative Mode Available Motivation for Walking: Convenience	Enjoyment	Exercise	Economy	Other	Total
Work	80	18%	30%	21%	14%	17%	100%
Shopping	88	28	26	15	13	18	100
Social/Recreational	88	18	35	30	5	12	100
Personal Business	50	22	28	14	8	28	100
School	11	9	27	9	18	37	100
Other	19	11	26	32	5	26	100
All Purposes	336	20%	30%	21%	10%	19%	100%
No Response	25						
Total	885						

Table 13

Elements of Comfort and Pleasure for Pedestrians of Six Trip Purposes

Trip Purpose	No. of Ped. Surveyed	Percent Responding to Elements of Comfort * Uncrowded sidewalk	Smooth walking surface	Level terrain	Unslippery walking surface	No obstacles
Work	236	26%	15%	8%	10%	13%
Shopping	238	24	19	8	10	12
Social/Recreational	179	23	12	6	7	12
Personal Business	142	20	11	8	6	10
School	25	36	20	12	12	8
Other	46	26	15	11	11	7
All Purposes	866	24%	15%	8%	9%	11%
No Response	19					
Total	885					

Trip Purpose	No. of Ped. Surveyed	Percent Responding to Elements of Pleasure * Trees/flowers	General appearance	cleanliness	Shops for browsing	Benches for resting	Shelter from sun and rain
Work	236	26%	13%	20%	19%	5%	9%
Shopping	237	31	21	19	34	17	8
Social/Recreational	179	35	24	27	17	13	12
Personal Business	142	31	17	19	16	11	9
School	25	40	32	16	12	8	17
Other	45	46	29	13	22	11	9
All Purposes	864	31%	22%	21%	21%	11%	12%
No Response	21						
Total	885						

* Totals do not equal 100% because respondents were not limited to one response.

Pedestrian Age and Its Influence on Walking Behavior and Perception

Age has a particularly significant influence on walking behavior and perception. It has its strongest effects on motivation and attitude toward walking, the psychological process of planning a walking route, contentment with traffic controls along a chosen route, and length of walking trip. It also influences personal comfort and pleasure in the walking environment. In many areas, a striking similarity was observed between elderly and young pedestrians. (Table 14 summarizes the influence of age on pedestrian behavior and perception.)

Trip Purpose: Certain age groups of pedestrians participate in certain activities more frequently than others. (See Table 15.) The largest proportion of surveyed adult pedestrians 25 to 64, for example, walk to work, while the largest proportion of surveyed children pedestrians younger than 15 and elderly pedestrians over 65 walk for purposes of shopping and social/recreation. The shopping trips of most children pedestrians were observed to be in the company of parents.

The occurrence of school trips by pedestrians older than 25 is explained by the location of universities in both Lincoln and Sacramento. The absence of children under 15 on school trips results from the location of the survey in downtown areas. Elementary school children do not generally walk through downtown on their way to neighborhood schools.

Motivation and Attitude Toward Walking: Age has a major influence on the availability of pedestrians' alternative modes of travel and on their motivation for walking when alternatives do exist. Larger proportions of pedestrians 65 and older and 15 to 24 do not have access to automobiles or adequate public transportation. (See Table 16.) The legal/institutional limitations on the young and elderly to operate automobiles and their high cost of operation combine to put them out of the reach of these groups. And most public transportation systems are not readily available to them for travel within the downtown.

When alternative modes are available, older pedestrians are increasingly motivated to walk rather than ride because of the exercise and enjoyment. At younger ages, pedestrians choose walking over available alternate modes for convenience and economy, with less motivation for exercise and enjoyment.

A positive attitude toward walking increases with the age of the pedestrian. (See Table 16.) Elderly pedestrians find walking most agreeable, walk most frequently, and are likely to use pedestrian facilities more often than younger pedestrians. Younger pedestrians also like to walk, but do not walk as frequently as the elderly except for reasons of convenience and economy.

Planning and Choice of Route: Children and the elderly are more likely than pedestrians of any other age group to walk spontaneous paths without planned walking routes in mind. (See Table 17.) Middle-aged

Table 14

Influence of Age on Pedestrian Behavior and Perception

PEDESTRIAN AGE and its influence on behavior and perception	MOTIVATION AND ATTITUDE TOWARD WALKING	INDIVIDUAL PLANNING AND CHOICE OF WALKING ROUTE	CONTENTMENT WITH TRAFFIC CONTROLS	WALKING TRIP LENGTH	PERCEPTION OF PLEASURE AND COMFORT IN THE WALKING ENVIRONMENT
CHILDREN Younger than 15	Alternative modes unavailable. Walk for convenience and economy. Smaller than average proportion of pedestrians with very good attitude towards walking.	Large proportion of unplanned walks without predetermined routes are chosen.	Very impatient; must wait too long before crossing intersections, do not have time to cross, have problems with cars/ trucks.	Short 3.7-block average; 85% less than 3 blocks.	---
TEENAGERS & YOUNG ADULTS 15 - 24	Alternative modes unavailable because trip is too short. Walk for convenience and economy as well as for enjoyment.	Smallest proportion of pedestrians who choose shortest route.	No outstanding discontent.	Lengthy 5.5-block average; 57% greater than 3 blocks.	Shops for browsing are pleasant, uncrowded and comfortable.
ADULTS IN THE INTERMEDIATE YEARS 25-44	Trip too short for travel other than by foot.	Very few unplanned walks.	Smaller than average proportion who must wait too long at intersections.	4.6-block average, 58% shorter than 3 blocks.	Unobstructed walking is comfortable.
MIDDLE-AGED 45-64	Trip too short for travel other than by foot.	Very few unplanned walks. shortest route chosen.	No outstanding discontent.	4.5-block average; 55% shorter than 3 blocks	Trees/flowers and general appearance are pleasant.
ELDERLY 65 and older	Alternative modes unavailable. Walk for exercise and enjoyment. Largest proportion of pedestrians with very good attitude toward walking.	Larger than average proportion of unplanned routes. Routes chosen for comfort.	Mild discontent; do not have time to cross intersections, have problems with cars/ trucks. Some do not understand "walk/ don't walk" signals.	Slightly lengthy 5.2-block average; 51% greater than 3 blocks	Benches for resting are pleasant.

Table 15

Pedestrian Age and Participation in Six Walking Trip Purposes

Age Group	Number of ped. surveyed	Work	Shop-ping	Social/ recrea-tional	School	Business	Other	Total
younger than 15	26	4%	42%	46%	0%	4%	4%	100%
15-24	354	27	33	18	6	14	2	100
25-44	244	30	22	20	2	21	5	100
45-64	159	37	20	18	0	17	8	100
65+	83	13	31	32	0	12	12	100
All ages	866	27%	28%	21%	3%	16%	5%	100%
No response	19							
Total	885							

Table 16

Availability of Alternative Modes of Travel and Motivation for Walking of Pedestrians of Five Age Groups

		Alternative Mode Unavailable						Alternative Mode Available						
		Reason:						Motivation for Walking:						
Age Group	Number of peds. surveyed	No Auto	No Public Transit	Cost too Great	Trip too Short	Other	Total	Number of peds. surveyed	Convenience	Enjoyment	Exercise	Economy	Other	Total
Younger than 15	16	19%	25%	6%	44%	12%	100%	11	36%	18%	18%	18%	19%	100%
15-24	201	15	11	3	54	21	100	150	23	29	16	11	21	100
25-44	168	6	10	2	65	19	100	76	25	30	17	9	19	100
45-64	103	9	12	0	71	8	100	55	15	31	27	7	20	100
65 +	39	13	15	8	39	25	100	44	7	34	39	7	13	100
All Ages	527	11%	12%	3%	59%	15%	100%	336	21%	30%	21%	10%	18%	100%
No Response								22						
Total	885							885						

Attitude Towards Walking of Pedestrians of Five Age Groups

Age Group	Total Pedestrian Surveyed	Like to Walk and Walk Often or Frequently	Walk Occasionally or Rarely	Total
Younger than 15	27	67%	33%	100%
15-24	348	78	22	100
25-44	241	81	19	100
45-64	156	85	15	100
65 +	80	87	13	100
All Ages	852	81%	19%	100%
No Response	33			
Total	885			

Table 17

Planning and Choice of Route by Pedestrians of Five Age Groups

Age Group	No. of Peds. Surveyed	Planning of Route: No planned route and/or destination	Planning of Route: Planned route to destination
Younger less than 15	27	41%	59%
15-24	355	25	75
25-44	246	20	80
45-64	160	17	83
65 +	83	34	66
All Ages	871	24%	76%
No Response	14		
Total	885		

Age Group	No. of Peds. Surveyed	Choice of Route — Reason: Shortest	Comfortable	Scenery	Other or None	Total
Younger less than 15	16	60%	0%	0%	31%	100%
15-24	269	52	6	6	56	100
25-44	197	67	5	5	23	100
45-64	123	65	4	3	28	100
65 +	48	58	13	2	17	100
All Ages	653	60%	6%	5%	30%	100%
No Response	232					
Total	885					

pedestrians 45 to 64 participate in the smallest proportion of unplanned walks. Children under 14 and adults in the intermediate years 25 to 44 choose the shortest route in larger proportions than young adults or elderly pedestrians. Larger proportions of the elderly choose a walking route to suit their personal comfort.

This profile indicates that children are spontaneous pedestrians who do not plan their walking trips and choose short-cuts whenever possible. Adult pedestrians appear to be very purposeful, rarely walking unplanned routes and choosing the shortest route whenever possible. Elderly pedestrians appear to be spontaneous, often having no planned route and seeking routes where they feel comfortable. Personal comfort for elderly pedestrians includes the security of safe and understandable traffic controls, physical comfort on the walking path, and suitability of the surroundings to their moods and preferences.

Contentment with Traffic Controls: Children under 15 are the most discontent of all age groups with traffic controls along their walking routes. (See Table 18.) Larger proportions of them report discontent with the length of time necessary to wait at red lights or "don't walk" signs, with the inadequacy of time allowed to cross intersections, and with traffic. Children's impatience is most apparent at intersections, where they must frequently be restrained from darting into traffic, crossing against the light, or otherwise disregarding traffic controls.

Discontent with traffic controls appears to diminish with maturity until intermediate adulthood (25-44), when the smallest proportion of any age group senses dissatisfaction. With advancing age, discontent increases. The elderly have difficulty in understanding "walk/don't walk" signs.

Walking Trip Lengths: Children walk the shortest average routes of all pedestrians. (See Table 19.) This may result from a combination of parental constraint, their identification with a relatively smaller area for walking, and their less positive attitude toward walking than older pedestrians.

Teenagers and young adults (15-24) walk the longest average routes. This results from a combination of their inaccessibility to automobiles and their increasing need to travel for social/recreational, personal business, shopping and every other purpose.

Pedestrians 25-64 walk less lengthy routes than young and elderly pedestrians. This results from their greater access to automobiles and the fact that they are less likely to take unplanned walking trips.

The average walk of elderly people is long because vehicles are not available for their trips and they have a highly positive attitude toward walking.

Table 18

Pedestrian Age and Contentment with Traffic Control*

Age Group	Number of peds. surveyed	Had to wait too long at light before crossing intersection	Did not have time to cross	Problems with cars, trucks or other vehicles	Did not understand "walk/don't walk" signs
Younger than 15	21	33%	43%	24%	0%
15-24	274	15	22	13	4
25-44	183	9	14	12	1
45-64	124	11	19	16	4
65 +	59	12	20	17	12
All ages	661	13%	19%	14%	4%
No response	224				
Total	885				

* Totals do not equal 100% because respondents were not limited to one choice.

Pleasure in the Environment: Large proportions of pedestrians of all ages acknowledge the pleasure of trees and flowers, general appearance, shops for browsing, cleanliness, and clean air. (See Table 20.) Smaller proportions recognize benches for resting, shelter from weather, safety from vandalism, quiet, and rest rooms as pleasant elements.

Graph 4 shows that not only do trees and flowers and cleanliness please a greater proportion of pedestrians of all ages, they also elicit the largest proportion of "very important" reaction. General appearance and shops for browsing elicit "moderately important" reaction. Benches for resting, shelter, safety from vandalism, quiet and rest rooms receive smaller proportions of "important" reaction. These findings suggest that pedestrians of all ages are most pleased by general environmental qualities and such elements of ambience as landscaping, land use, general appearance and control of litter and pollution rather than specific amenities such as benches, shelter, or rest rooms. This suggests that pedestrian pleasure cannot be accommodated by the provision of limited amenities, but by widespread improvement of the pedestrian environment.

Personal Comfort in the Pedestrian Environment: Personal comfort has lower priority than pleasure among pedestrians. (See Table 21.) A smaller proportion acknowledge such elements of personal comfort as uncrowded walkways, smooth walking surfaces, unobstructed walking paths, and lack of steepness or slipperiness.

Table 19

Percent Distribution of Pedestrians by Age and Trip Length

Age Group	Number of Pedestrians Surveyed	Trip Length in Blocks										Average Walking Trip Length
		0-1	1-2	2-3	3-4	4-5	5-6	6-8	8-10	10 +	Total	
Younger than 15	13	0%	15%	38%	31%	0%	0%	8%	0%	8%	100%	3.8 blocks
15-24	254	2	11	14	16	15	8	9	10	15	100%	5.6
25-44	189	3	20	18	18	8	4	12	8	9	100%	4.7
45-64	126	7	18	21	9	8	9	11	8	9	100%	4.6
65 +	47	2	21	10	16	8	8	12	8	15	100%	5.3
All Ages	631	3%	16%	16%	15%	11%	7%	11%	9%	12%	100%	5.1 blocks
No Responses	254											
Total	885											

Table 20

Elements of Pleasure in the Walking Environments for Pedestrians of Five Age Groups

Age Group	Number of peds. surveyed	Acknowledgement of elements of pleasures as percent of all pedestrians in each age group * Trees/ Flowers	General Appear-ance	Cleanli-ness	Stores for Browsing	Clean Air	Benches for Resting	Shelter from Weather
Younger than 15	26	31%	23%	23%	26%	8%	39%	12%
15-24	355	35	21	21	27	12	10	11
25-44	246	25	23	21	18	14	8	14
45-64	160	33	27	22	15	19	13	9
65 +	82	31	16	12	9	10	16	11
All ages	869	31%	22%	20%	21%	13%	11%	11%
No response	16							
Total	885							

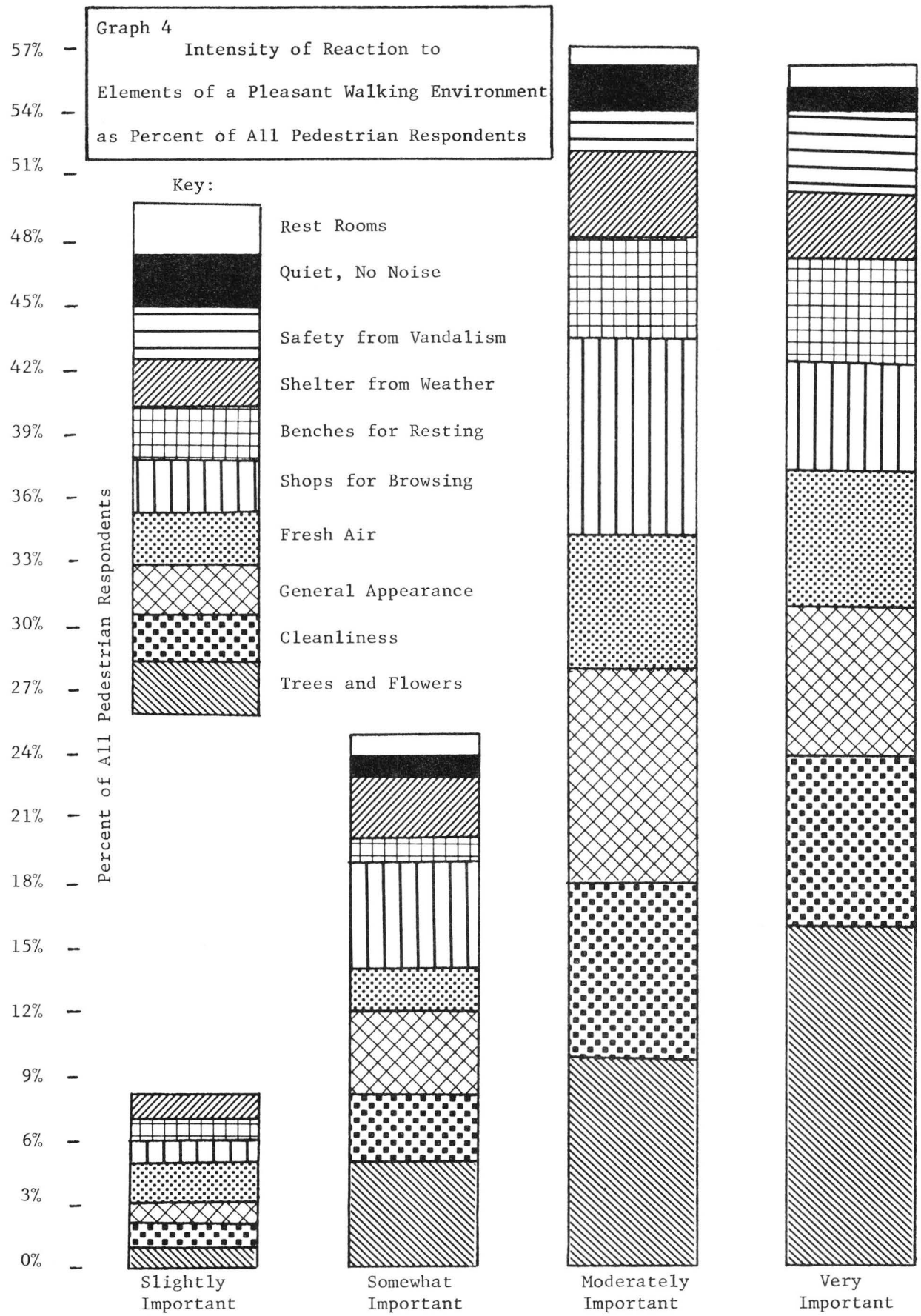
* Totals do not equal 100% because respondents were not limited to one choice.

Table 21

Elements of Comfort in the Walking Environment for Pedestrians of Five Age Groups

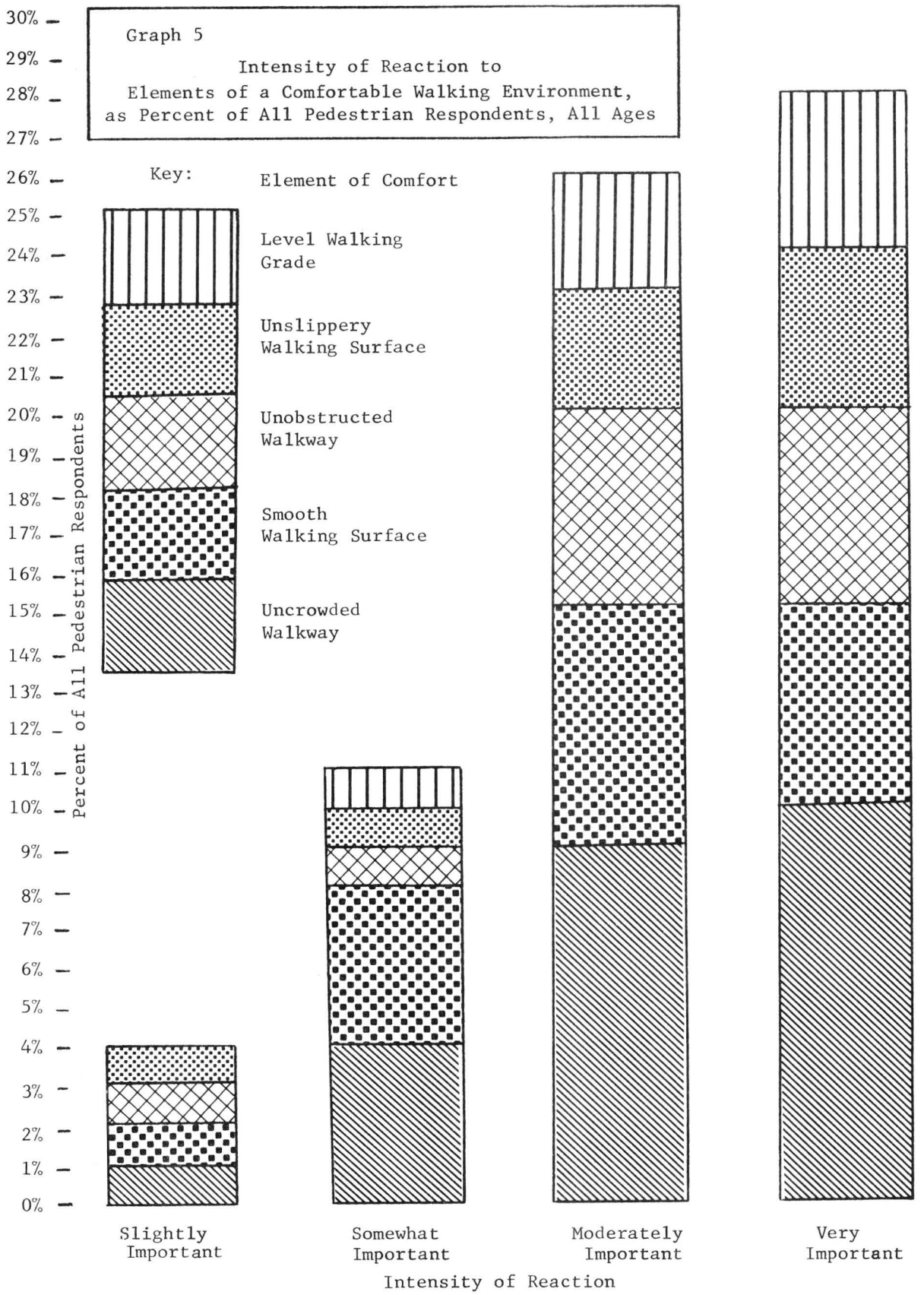
Age Group	Number of peds. surveyed	Acknowledgement of elements of comfort as percent of all pedestrians for each age group * Uncrowded Walkway	Smooth Walking Surface	Unobstructed walkways	Unslip-periness	Unsteep-ness
Younger than 15	27	22%	15%	11%	7%	7%
15-24	355	29	18	12	10	9
25-44	246	21	15	14	8	9
45-64	160	24	14	8	9	9
65 +	83	13	8	6	6	3
All Ages	871	24%	15%	11%	8%	8%
No Response	14					
Total	885					

*Totals do not equal 100% because respondents were not limited to one choice.


Graph 4
Intensity of Reaction to
Elements of a Pleasant Walking Environment
as Percent of All Pedestrian Respondents
Key:
Rest Rooms
Quiet, No Noise
Safety from Vandalism
Shelter from Weather
Benches for Resting
Shops for Browsing
Fresh Air
General Appearance
Cleanliness
Trees and Flowers
57%
54%
51%
48%
45%
42%
39%
36%
33%
30%
27%
24%
21%
18%
15%
12%
9%
6%
3%
0%
Percent of All Pedestrian Respondents
Slightly Important
Somewhat Important
Moderately Important
Very Important
Intensity of Reaction

Graph 5

Intensity of Reaction to
Elements of a Comfortable Walking Environment,
as Percent of All Pedestrian Respondents, All Ages



Graph 5 shows that uncrowded walkways receive the largest proportion of "very important" reactions as well as the largest proportion of recognition among all pedestrians. All other elements of personal comfort receive less "important" reaction.

Influence of Sex on Pedestrian Behavior and Perception

The sex of an individual pedestrian influences the purpose for which he or she walks and slightly affects the choice of walking route and personal pleasure in the pedestrian environment. (Table 22 summarizes the nature of these effects.)

Trip Purpose: A greater proportion of female than male pedestrians walk for purposes of shopping and journey to work. (See Table 23.) This results in part from their lack of an automobile, which may be used by another member of their household.

A larger proportion of males walk for social/recreational and personal business purposes. This is explained in part by the walks of businessmen to lunch. In contrast, many women walk for shopping on their lunch hour, even though they may eat lunch while on their walk.

Choice of Walking Route: Most pedestrians, men and women, claim to choose the "shortest" route, but more men than women judge a route by this criterion. (See Table 24.) Slightly more men also choose a route for its "scenic" value. Larger proportions of women choose a route because of shopping opportunities along the way.

Perception of Pleasure: Males and females have different perceptions of what is pleasurable in the pedestrian environment. (See Table 25.) More males appreciate general appearance and cleanliness, while more females respond to trees and flowers and shops for browsing as pleasant.

Table 22

Influence of Sex on Pedestrian Behavior and Perception

SEX OF PEDESTRIAN	TRIP PURPOSE	CHOICE OF ROUTE	PERSONEL PLEASURE
MALE	Larger proportion than of female pedestrians walk for social/recreational and personal business purposes. Large proportions, also, of shopping and work trips.	Predominantly choose shortest route; larger proportion than of women choose "scenic" route.	Cleanliness and general appearance pleasant.
FEMALE	Larger proportion than of male pedestrians walk for work and shopping trips.	Larger proportion than a male pedestrians choose a route for shopping opportunities along the way.	Trees, flowers and shops for browsing pleasant.

Table 23

Influence of Sex on Walking Trip Purpose

	Pedestrians Interviewed	Trip Purpose						
		Work	Shopping	Social/ Recrea- tional	Personal Business	School	Other	Total
Male	446	21%	23%	28%	19%	3%	6%	100%
Female	398	34	34	13	12	3	4	100
All	844	27%	28%	21%	16%	3%	5%	100%
No Response	41							
Total	885							

Table 24

Reasons for Choice of Pedestrian Route by Males and Females

	Number of peds. surveyed	Reason for Choice of Route				
		Shortest	Scenery	Shopping	Other	Total
Male	336	63%	6%	7%	24%	100%
Female	301	57	3	12	28	100
All	637	60%	5%	10%	25%	100%
No Response	248					
Total	885					

Table 25

Elements of Pleasure in the Pedestrian Environment for Males and Females

	Number of peds. surveyed	Percent Responding to Elements of Pleasure*				
		Flowers	Appearance	Cleanliness	Shops for Browsing	Other
Male	448	34%	24%	23%	26%	13%
Female	399	29	19	17	17	12
All	847	21%	22%	20%	21%	13%
No Response	38					
Total	885					

*Total does not equal 100% because respondents were not limited to one answer.

IV. DESIGNING FOR THE PEDESTRIANS

An internal dialogue is constantly going on between every walker and his or her environment. Understanding this dialogue is the basis for evaluating the design of facilities for walkers.

Comfort factors are the internal criteria that people use in deciding on a place to walk. These vary for each individual, but there are general modes of behavior by socioeconomic type and trip purposes.

These comfort factors are psychological, functional, and physical--and they seem to be in that order of priority. Fear of people, for example, might keep a walker away from a place even though he or she wants to go to a store there. Yet, if the fear is removed, the same walker would go to that store even if it were physically somewhat uncomfortable (say a walk in hot sunlight) to do so. Extremes in any area of discomfort can make any walking place undesirable.

Every environment -- especially dense urban areas -- displays many images. Each individual sees only the images that fit into his or her vocabulary. Each walker's vocabulary is his or her internal set of comfort factors. If a businessman is in a hurry to catch a bus, he doesn't notice the shops along the way. A woman shopper doesn't notice the bus stops. But a woman shopper who is afraid of panhandlers does notice the panhandlers. In this way people decide where to walk from among choices within their internal vocabulary.

Because a common mode of walking behavior is shared by socioeconomic groups, walking patterns can be plotted for each group within any area. Pedestrian shopping paths, such as business paths and those on which the elderly socialize, tend to be linked. These path systems can be isolated for each type of walker. Many will overlap, resulting in a series of networks each of which responds best to the comfort factors of some group.

Our findings strongly suggest that appropriate design of the pedestrian environment can accommodate and even reinforce the behavior of pedestrians. They also suggest that the total environmental quality of pedestrian surroundings is more important to the pedestrian than any single element, such as benches, shelter, rest rooms, sidewalk widths, or timing of control signals.

Designing for pedestrians is significantly different from traditional transportation design for other modes which emphasizes system capacity, speed, and traffic flow. While pedestrians recognize "uncrowdedness" (which is related to capacity and flow) as their most important comfort factor, they give equal or greater importance to trees and flowers, general appearance, cleanliness and shops for browsing. The major criteria of pedestrian design are quality of ambience and appropriateness of design to the needs of

pedestrians -- both pedestrians in general and specific pedestrian groups, such as the elderly, children, shoppers, and business people. Walking combines the activities of transportation and other purposes, including work, shopping, recreation and sociability. Thus the total pedestrian environment including landscaping, architecture, furnishing, and services should be given equal or greater priority to sidewalk widths and control signal timing.

In certain locations, a larger than usual proportion of pedestrians might be elderly people walking to social/recreational activities; or business people walking to and from work; or women on shopping trips, or children on their way to school. Accommodations for these special groups of pedestrians are more appropriate at certain locations than at others and should respond to the observed needs of these particular groups. This would promote domains of pedestrian groups throughout the walking network, reinforcing each group's sense of belonging at particular locations. It would also attract additional members of a targeted group from nearby walking routes to take advantage of special accommodations.

Data Gathering

We found that slight variations of standard planning analysis were helpful in understanding walking behavior. None of the techniques we used proved conclusive by itself, but taken as a group they all helped to clarify the actual pedestrian situation.

Land-Use Analysis was one of the most useful tools we had in predicting who would walk where, and in what proportion. Obviously, a housing-for-the-elderly project means that there will be a larger proportion of elderly in that area. Land-use analysis can also help to establish walking networks. Housing for the elderly that is near a park and a major bus terminal or inexpensive shopping area will generate predictable paths of elderly pedestrians.

Traffic Counts of pedestrians should be done by user types so that an overall pattern of "who walks where" can be determined. In general, we used pedestrian traffic counts to document our estimates of overall patterns. It is relatively easy to categorize a walker by age, sex, and -- to some extent trip purpose with just a glance. Elderly social walkers go slowly, talking to other old people; business people carry briefcases and walk quickly; shoppers look in windows and often carry packages. Traffic counts can also be used to determine whether path capacity seems adequate. Pedestrian traffic counts should be done at various times of day because peak-hour pedestrian traffic does not always coincide with commuter peak hours. In Boston's North End, for example, many more pedestrians were on the streets at 3 p.m. than at 5:30 p.m. during the height of commuter traffic.

Origin/Destination Studies showing actual trip paths should be done. Usually pedestrians in a dense urban area have several choices of routes, and trips cannot be allocated to paths unless O&Ds are accompanied by actual route maps. The maps can be combined and analyzed by user types to get a clear picture of walking patterns. They show, in definitive form, who is walking where.

Tracking or following someone on a walking trip is the most effective way of discovering and analyzing comfort factors and how they relate to a given place. By candidly following someone and recording his or her behavior it becomes clear what the person's internal desires are and how well the environment is satisfying them. Tracking proved the most effective technique for understanding this crucial element in establishing design criteria.

Observation of Facilities such as bus stops, traffic intersections, and malls yields good information on the problems and opportunities that exist for walkers in any given situation. It is also useful in discerning such aspects of group behavior as local "rules of the road" and comfort factors. Observation of particular places did not lead us to understand overall patterns but suggested many specific design-oriented ideas.

Photo-Analysis can provide a statistical check on ideas just as questionnaires provide statistical information. We used slides and memo-motion films of intersections to check the validity of ideas generated from direct observation. Photo-analysis can identify the people in a space, check where they are all looking, see how a curb causes a specific problem for the elderly, and study groupings of people in a way that observation does not allow. Photos limit understanding, however, because they are focused on a limited area and time.

Questionnaires that ask pedestrians for subjective opinions about influences on their behavior can result in misleading information. Often the observed behavior of pedestrians differs significantly from their subjective reasoning. We concluded that this resulted from the subconscious nature of much pedestrian behavior. Pedestrians are more aware of the characteristics of their surroundings than of their reasons for behaving in a specific manner.

Comprehensive Pedestrian Planning and Design Process

We organized our study and findings around the objective of improving the state-of-the-art of designing pedestrian facilities. Our main task was to understand pedestrian behavior, and we wanted to see how our new understanding would be useful. The following progression of tasks suggests what the design process might be, given our findings:

First, an existing land-use situation should be evaluated. Land uses should be identified and associated with various pedestrian users. The attractivenss of land uses to each pedestrian user group should be

expressed as a proportion of the total downtown walking population. Each user group's area should then be plotted on a separate map that can be combined with similar maps of all other groups.

Second, an origin/destination study should be done and evaluated for each user group on separate overlay maps. These maps sh ould be related to the land-use maps, and the land-use pedestrian user analysis should be corrected to correspond to actual walking patterns.

Third, traffic counts should be done to establish the validity of the network found through the O&D study and to establish the actual number of walkers on the street.

The result of these three tasks should be a clear and accurate picture of the existing walking pattern by user types and how it relates to the land uses of any given place.

Fourth, tracking of individuals should be done within the area to check on the comfort factors of each group of walkers. A second analysis comparing users and comfort factors should be performed. This comparison can be used to determine where comfort and discomfort are extreme. A third analysis comparing comfort factors and land uses may also be used. These analyses will relate groups of users to their comfort needs.

Fifth, observation should be used to examine areas of overlap, dense use, and special use. In fact, all parts of the pedestrian system should be subjected to some direct evaluation by observation. These observations should be recorded on a map to show problems and opportunities (by user group, when appropriate).

Sixth, a reasonable future should be projected showing future land-use patterns and population projections by type. The analysis of pedestrian users and land uses can aid in projecting the effect futur changes will have on the distribution of walkers. Thus, future pedestrian patterns can be mapped by user type, whose needs can be assumed to be similar to those of present users of similar type.

Seventh, questionnaires, workshops, or other means can be used to elicit subjective views of future needs and goals. This information should also be gathered and used in categories by user types.

Eighth, a series of alternative designs that make specific proposals of pedestrian improvements for each pedestrian group should be generated.

These proposals should be keyed to the map of the existing and future pedestrian pattern. While responding to special problems and opportunities, the design recommendations should be keyed primarily to the comfort factors of the users of the street.

We have outlined this process in sequential fashion, but the order of the sequence is not the important thing. The important thing is that each element is checked against the other at some point. As with any other design process, the design and information should pass through phases of refinement rather than through some long, laborious sequence that produces a final and irrevocable design.

No design should eliminate any existing facilities that are comfortable for some pedestrian group. Designs should make places more comfortable for every group, and for groups to mix with each other.

Design Criteria

Any design for pedestrian facilities should make the existing system work better by increasing or extending choice. The final analysis of how good or bad a pedestrian facility is should be based on how well it responds to each particular kind of walker's comfort factors. These are the criteria the walker uses in deciding whether to walk from one place to another on any given path.

Design criteria never guarantee a work of art. They are meant only to specify the direction of adequacy. In this sense, adequacy lies in responding to the comfort factors of walkers.

In areas of high use by elderly pedestrians, such as older residential and commercial locations, accommodations should be proved over a minimum five- to six-block area, including the zone of greatest elderly pedestrian trip density, to accommodate the average walking trip length of elderly pedestrians. Benches on which the elderly can rest and socialize should be placed along these networks, and ramps should be provided to eliminate the inconvenience and hazard of curbs. Traffic lights should be timed to allow lengthy crossings (about 35 second for 50 feet of roadbed). The length of waiting time before crossing intersections is not critical because the elderly are patient with "don't walk" signals, as long as the waiting times of 25 to 33 seconds observed in this study are not increased significantly.

In the long term, the construction of housing for the elderly within walking distance (5.1 blocks average) of parks, libraries, and inexpensive shopping areas should be encouraged. This would accommodate social/recreational and shopping tris, which are the most common purposes of walks by the elderly. The construction of housing for the elderly in exclusively residential areas or near retail areas not patronized by the elderly will force them to take uncomfortably long walks or vehicular travel to reach locations that are comfortable to them.

In areas used by children, such as the neighborhoods of playgrounds and schools, pedestrian routes should offer many shortcuts, which children prefer, and should minimize conflict with traffic and traffic controls. Children are the most impatient of all pedestrians with these inconveniences. They are also the most curious and observant. Thus, playground equipment and educational kiosks along their walking paths should attract their attention and occupy their enthusiasm.

In areas of intense shopping activity, a broad network of path options should be provided over a minimum area of five square blocks including the zone of greatest pedestrian shopping trip density, to accommodate the average walking trip length of shoppers. Path options are important for shoppers who walk spontaneous and meandering routes.

The opportunity to shop while walking should be increased. Store displays, counters, and browsing areas should be expanded along the walking paths of these areas to satisfy the need to browse. This could be achieved by projecting store elements into the pedestrian network and by recessing storefronts to increase the amount of window area along the path.

In areas of intense office employment, especially between these areas and nearby residential neighborhoods, long, direct, unobstructed routes should be designed for pedestrian travel to work. Pedestrians will walk lengthy routes (8.1 blocks average) between home and work, and they appreciate unobstructed and uncrowded paths.

In the long term, residential and employment areas should be developed within walking distance of each other. Many people prefer to walk to work, even over long distances, because it is convenient and economical.

The following list of miscellaneous design criteria illustrate accommodations that would improve pedestrians' comfort:

Bus Stops: (1) awnings for shade and protection from rain, (2) heaters for cold weather, (3) benches for waiting without blocking traffic or views of merchandise and oncoming buses.

Intersections: (1) street furniture located to assist in channeling pedestrian flow, (2) streets graded to sidewalks in lieu of ramps, (3) signal timing adjusted for bad weather crossing.

Construction Barricades/Temporary Walkways: (1) simple and direct horizontal/vertical channeling, (2) directional information.

Malls: (1) counterclockwise directional movement, (2) shop entrances oriented to stop/start movements of pedestrian flow, (3) subareas located off the mainstream, (4) landscaping, (5) infill of activities to maintain shop/store continuity of uses.

Stairs/Escalators/Ramps: (1) oriented in direction of major movement, (2) maximize daylight, artificial night light, and openness.

Walkways: (1) 5-ft. minimum width in residential areas, (2) 10- to 15-ft. in downtown areas, with 1/8":1' slope for drainage, (3) separated from moving lane of vehicles by landscaping, parking lane, handrails.

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The findings of our study have produced two significant conclusions -- the first based on the results of the questionnaire, the second on our observations of pedestrian behavior.

The first conclusion is that pedestrians rarely express pleasure or displeasure with the walking environment. When auto traffic is hazardous, or noise and pollution are particularly offensive, or crowding makes sidewalks impassable, pedestrians articulate only mild protest. When benches, landscaping, and other amenities are abundantly provided, they express only modest satisfaction. But when conditions are neither very good nor very bad, their remarks about these conditions are passive and unconcerned.

The second conclusion is that groups of pedestrians behave in characteristic ways -- often in ways that contradict the reasons they give for their behavior. The location of pedestrians in the pedestrian network, their trip purpose, and their age all have a discriminate influence on their behavior.

Taken in combination, these two conclusions have significant policy implications. They suggest that, although pedestrians do not articulate their responses to the walking environment, they nevertheless do respond by the way they behave. When benches are provided in the proper locations they sit on them. When parks are properly designed, they linger in them. When ramps are provided, they take advantage of them. The impact of such intangible amenities as colors and interesting paving patterns cannot be measured, but they also affect pedestrian behavior positively.

One possible explanation for the contradictions between pedestrians' behavior and verbal expressions has been advanced by Francis M. Carp, Ph.D., of the Wright Institute, in a letter to our study group:

> "We know from many sources that people who are trapped in a bad situation tend to undercomplain to others and probably also to underperceive their dissatisfaction as an ego-defensive maneuver. Submariners refuse to answer negative sociometric items about crewmates when they are on long underwater cruises -- but not ashore. The old in the San Francisco Bay Area tend to verbalize less dissatisfaction about their residential environments, their transportation, etc., though secondary data show that they in general are in inferior situations.

"You were puzzled also by the fact that improved intersections were not perceived as much better than others. It is conceivable that this, too, is partly based on expectations. More is expected of an "improved" intersection, and the discrepancy between expected and observed therefore widens. We certainly do not have conclusive evidence along these lines, but I hope we can figure out how to get some!"

Our findings suggest that extremely offensive and inconvenient conditions at certain locations should be rectified. There is no excuse for inaction here. Just as important, they suggest that there is sufficient justification for upgrading the pedestrian environment even when it is not particularly offensive. Those who execute these improvements are not likely to have their efforts rewarded with praise -- except perhaps from architecture critics and those elite who are knowledgeable about environmental design -- but they are likely to find people using the improvements. This, after all, is the real proof of the pudding.

Beyond this is the question of raising the consciousness of pedestrians. We believe that more people are consciously aware of their surroundings today than they were some years ago. The emphasis given to the environment by the media and by public concern has caused more people to examine their environment and to make decisions about what pleases them and what displeases them.

Efforts to raise the consciousness of pedestrians require extensive and long-range programs in urban planning, development, and land-use management. An occasional curb ramp or additional tree will not provoke wild enthusiasm. But efforts to produce total pedestrian environments that are comfortable, pleasant, safe, and interesting to be in will, in time, bring more and more people to the conscious realization that a good pedestrian environment enhances their well-being.

Recommendations

Based on the findings and conclusions of this study, the following action-oriented policy recommendations are proposed:

1. A leadership program of pedestrian improvements should be initiated to accommodate pedestrian needs, and to stimulate the environmental consciousness of pedestrians.

Although pedestrians do not make conscious demands for walking facilities, they nevertheless respond behaviorally to the pedestrian environment. An extensive program of urban planning, development and land-use management should be initiated to improve conditions for this form of transportation and urban activity, and similtaneously to improve the general environmental quality of the pedestrian right-of-way.

The highly favorable attitude of many pedestrians towards walking as a mode of transportation and form of activity justifies greater attention to the needs of this almost universal group. Higher priority should be given to a program of pedestrian improvements than has been given in the past. Public funds should be provided to plan and design networks of pedestrian activity to accommodate the behavior of pedestrians. The same attention should be given to the needs of walkers in the pedestrian environment that is given to shoppers in stores, workers in offices, students in schools, and residents in their homes. The pedestrian network should be planned and designed with the same amount of architectural consideration and detail given to these other specialized facilities.

Beyond the responsibility of a program to accommodate the needs of pedestrians is the obligation to anticipate increased environmental consciousness of pedestrians. In this time of rapidly expanding environmental awareness, it may not be long before pedestrians recognize the shortcomings and inadequacies of their environment and begin to expect improved accommodations. A program of widespread pedestrian improvements should be initiated to anticipate demand, provide accommodations in response to rising expectations, and bring about a constructive consciousness-raising of pedestrians.

2. Extremely offensive and inconvenient pedestrian conditions should be rectified immediately.

There is no excuse for inaction in cases where auto traffic is hazardous to pedestrians, or noise and pollution are particularly offensive, or crowding makes sidewalks impassable. There are very few locations where pedestrians articulate emphatic reactions to these conditions, but where they do, immediate action is necessary. Greater priority should be given to pedestrians in traffic control signalization at intersections where auto traffic is particularly hazardous; remedial steps should be taken to reduce noise and other environmental hazards where these are particularly offensive, and sidewalks should be widened in those few places where crowding makes passage impossible.

3. A program of pedestrian improvements should be directed to the whole pedestrian network of a city, not just to one or a few heavily traveled locations.

Public funds for the provision of pedestrian accommodations should require a comprehensive planning effort for the entire pedestrian network as a prerequisite to funding approval. Pedestrian census counts should be taken at all locations to determine the predominant user groups throughout each network. Accommodations should be planned for the predominant user groups at numerous locations before improvements are approved for any single location. This distribution of pedestrian improvements throughout whole cities will ensure that total environments are being improved for use by all pedestrians, and that particular locations and particular

pedestrians are not being disproportionately favored. Capital expenditure for the pedestrian environment should be invested in widespread improvement of conditions for the pedestrian mode of transportation and activity.

4. Greater incentives should be provided for users of land along the pedestrian right-of-way to make pedestrian improvements.

The predominant users of land in any location should be encouraged to project their facilities and the quality of their internal environments into the pedestrian network. This would accommodate the behavior of those pedestrians who are destined both for the immediate facilities and for other similar facilities nearby. Stores should be encouraged to expand sales displays and counter space, and to recess storefronts along pedestrian routes; offices should be induced to project the prestige of their lobbies into the pedestrian network, and parks and playgrounds should be encouraged to include the surrounding pedestrian paths in their design of recreational facilities.

The incentives to make these improvements in surrounding pedestrian environments might include zoning variances and capital grants or awards to land users along the pedestrian network. These users of land are often the best judges of pedestrian needs in their vacinity, and their efforts to accommodate visitors to their facilities and other pedestrians passing by should be encouraged.

APPENDICES

APPENDIX A

Characteristics of Selected Pedestrian Study Cities

City	Geographic Location	1970 City Pop. (000's)	Age: % 65 and over	Age: % Under 18	Ped. Laws and Enforcement[1]	Special Pedestrian Facil.	Primary Mode of Work Trip[2]: Auto	Transit	Walk
Cincinnati[3]	MW	453	13.0%	31.2%		X	81.3%	9.5%	2.9%
Boston[3]	NE	641	12.8	28.5			66.2	19.8	10.3
Lincoln[4]	MW	149	10.1	29.4			81.3	3.7	9.1
Sacramento[4]	W	254	11.1	32.0	X	X	89.2	2.6	3.4
Washington, D.C.[4]	SE	757	9.4	29.8		X	75.5	14.2	5.7

1. IPA research has shown that most states, with the exception of California and Oregon, have adopted the Uniform Vehicle Code with respect to pedestrian and vehicle right-of-ways. That code states that in pedestrian crosswalks where no traffic control signals are in place, the vehicle shall yield right-of-way to pedestrians who are in that half of the crosswalk and roadway area upon which the vehicle is traveling or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger. California and Oregon traffic law states that vehicles must yield right-of-way to all pedestrians in the crosswalk area regardless of which side of the roadway they are in.

2. It should be noted that these modal split data are not CBD-related but rather related to the larger urban ized area. SOURCE: 1970 Transportation Characteristics in Urbanized Areas, tables prepared by the FHWA Office of Program Planning.

3. Pedestrian experience studied by observation, trackingand photography.

4. Pedestrian experience studied by survey poll, observation tracking and photography.

Revised 8/8/73

Appendix B: Survey Poll Instrument and Aggregated Responses of All Respondents_/

INSTITUTE OF PUBLIC ADMINISTRATION

PEDESTRIAN NEEDS AND ACCOMMODATIONS STUDY

FIELD INTERVIEW FORM

Interview No._____ Time:_____ Date:_____

This survey is sponsored by the Institute of Public Administration -- a non-profit research organization located in New York and Washington,D.C. It is intended to identify pedestrian needs and to help improve pedestrian facilities. You can help by answering all of the following questions. NO PERSONAL IDENTIFICATION IS NEEDED and your identity will in no way be revealed. Thank you for your help.

BLOCK 1: TRIP DATA

1. Is this walking trip part of a larger trip? Yes ☐ *1* No ☐ *2*

2. Where are you coming from: (Specify)

_____ _____ _____
Place Nearest intersection City/Town

3. Place of residence if different from above. _____
City/Town

4. Where will this trip end? (Specify)

_____ _____ _____
Place Nearest intersection City/Town

THE FOLLOWING QUESTIONS CONCERN ONLY THE WALKING TRIP YOU ARE TAKING NOW.

5. Please indicate where this walk started and where it will end.

Start:_____ Finish:_____
(Nearest intersection) (Nearest intersection)

6. Did you start this walking trip from: (Select one)

Office Building/Bank	☐ *1* (230)	Your home	☐ *5* (213)
Store	☐ *2* (83)	Parked car/Auto Drop-off	☐ *6* (227)
Bus Stop/Other transit station	☐ *3* (108)	Other	☐ *7* (48)
Restaurant	☐ *4* (23)	(Specify)_____	

(TOTAL 932)

7. Will you end this walking trip at:

Office Building/Bank	☐ *1* (261)	Your home	☐ *5* (99)
Store	☐ *2* (236)	Parked car/Auto Drop-off	☐ *6* (82)
Bus Stop/Other Transit Station	☐ *3* (92)	Other	☐ *7* (81)
Restaurant	☐ *4* (33)	(Specify)_____	

_/ The numbers in parentheses next to each question response indicate the number of respondents making that answer in both Lincoln and Sacramento. (TOTAL 884)

8. What is the main purpose of this trip? (Select one)

Work (To or From)	☐ 1	(235)	Recreational/Social	☐ 4	(184)
School	☐ 2	(29)	Business Related	☐ 5	(144)
Shopping	☐ 3	(234)	Other (Specify)_____	☐ 6	

(TOTAL 826)

9. How often do you walk this route? (Select one)

5 or more days a week	☐ 1	(359)
Less than 5 days a week	☐ 2	(281)
2 days a month or less	☐ 3	(152)
First time	☐ 4	(78)

(TOTAL 870)

IF ROUTE WALKED 2 DAYS A MONTH OR LESS, ANSWER QUESTIONS 10 AND 11; OTHERWISE PROCEED TO QUESTION 12.

10. In order to find your way, did you:

a. Depend on street signs	Yes ☐ 1 (81)	No ☐ 2 (49)
b. Depend on door numbers	Yes ☐ 3 (69)	No ☐ 4 (67)
c. Use landmarks or important buildings	Yes ☐ 5 (56)	No ☐ 6 (68)
d. Ask people	Yes ☐ 7 (58)	No ☐ 8 (60)
e. Use maps	Yes ☐ 9 (42)	No ☐ 10 (112)
f. Other (specify)_____		☐ 11 (108)

(TOTAL 770)

11. On a scale of 1 to 4, shown below, for those items answered Yes, would you rate the extent to which you depend on each of the items named above.

(1)	(2)	(3)	(4)
Occasionally	Often	Very frequently	Always

List from Question 10

_____
_____
_____
_____
_____
_____
_____

Scale Code (Question 11)

	1	2	3	4
a	9	16	20	32
b	8	7	7	3
c	21	16	18	17
d	9	10	4	2
e	6	1	1	2
f	0	0	0	1

12. Could you have used any other means of transportation for this trip?

Yes ☐ 1 (325) No ☐ 2 (551)

(TOTAL 876)

13. If No, why not?

No car available	☐ 1 (57)		
No driver's license	☐ 2 (13)	Other means too expensive	☐ 5 (14)
No public transportation	☐ 3 (64)	Trip too short	☐ 6 (313)
No taxi	☐ 4 (3)	(Blocks_____)	
		Other_____	☐ 7 (68)

(TOTAL 532)

14. If Yes, why did you choose to walk? (Select one)

Convenient	☐ 1 (71)	Like to walk/Pleasant	☐ 5 (97)
For Exercise/Healthier	☐ 2 (70)	Trip too short	☐ 6 (28)
Poor public transportation	☐ 3 (12)	(Blocks _____)	
Cheaper	☐ 4 (31)	Other_____	☐ 7 (33)

(TOTAL 342)

15. Would you select from the list below the phrase that best characterizes your attitude about walking generally:

Like to walk as often as possible	☐ 1 (479)
Like to walk frequently	☐ 2 (203)
Like to walk occasionally	☐ 3 (106)
Don't like to walk and rarely do	☐ 4 (54)

(TOTAL 842)

16. Would improved walking conditions encourage you to make more walking trips?

Yes ☐ 1 (467) No ☐ 2 (369) (TOTAL 836)

17. If Yes, what are they?_____

BLOCK 2: PATHWAY

18. On the map I just handed you, would you mark the route you intend to use or are presently following?

Don't have planned route to destination	☐ 1	(152)
Don't have planned destination	☐ 2	(9)
Have neither planned route nor destination	☐ 3	(36)
Other (specify)_____	☐ 4	(0) (TOTAL 197)

FOR THOSE WHO MARK THEIR ROUTE ON THE MAP

19. Why did you choose this route?

Shortest	☐ 1 (375)	Comfortable	☐ 5 (41)
Safest	☐ 2 (17)	No Special Reason	☐ 6 (81)
Interesting Scenery	☐ 3 (30)	Other (Specify)_____	☐ 7 (36)
Shopping	☐ 4 (60)		

(TOTAL 640)

20. Select the items, if any, that you feel made this walk comfortable.

List Code (Check)		
Uncrowded sidewalk	☐ 1	(199)
Even or smooth sidewalk	☐ 2	(123)
Not steep	☐ 3	(65)
Not slippery	☐ 4	(71)
No obstacles	☐ 5	(88)
Other_____	☐ 6	(18)
Nothing in particular	☐ 7	(1)

(TOTAL 565)

Scale Code			
1	2	3	4
11	30	71	87
9	21	49	44
6	8	19	32
9	6	22	34
8	10	34	36
2	0	3	13
1	0	0	0

21. For each item selected in Question 20, rate the degree of comfort on a scale of 1 to 4:

(1)	(2)	(3)	(4)
Slightly Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable

22. Select the items, if any, you feel made this walk uncomfortable.

List Code (Check)			Scale Code			
			1	2	3	4
Crowded sidewalk	☐ 1	(47)	13	13	11	10
Uneven or rough sidewalk	☐ 2	(113)	23	25	21	44
Too steep	☐ 3	(12)	3	2	4	3
Slippery	☐ 4	(7)	1	2	2	2
Obstructions and obstacles	☐ 5	(66)	13	11	12	30
Other_____	☐ 6	(30)	2	5	7	16
Nothing in particular	☐ 7	(3)	2	0	0	1
		(TOTAL 278)				

23. For each item selection in Question 22, rate the degree of discomfort on a scale of 1 to 4:

(1)	(2)	(3)	(4)
Little Discomfort	Some Discomfort	Moderate Discomfort	Very Uncomfortable

24. Did you find any obstructions or obstacles in your path? If so, what were they?_____

BLOCK 3: TRAFFIC CONTROLS

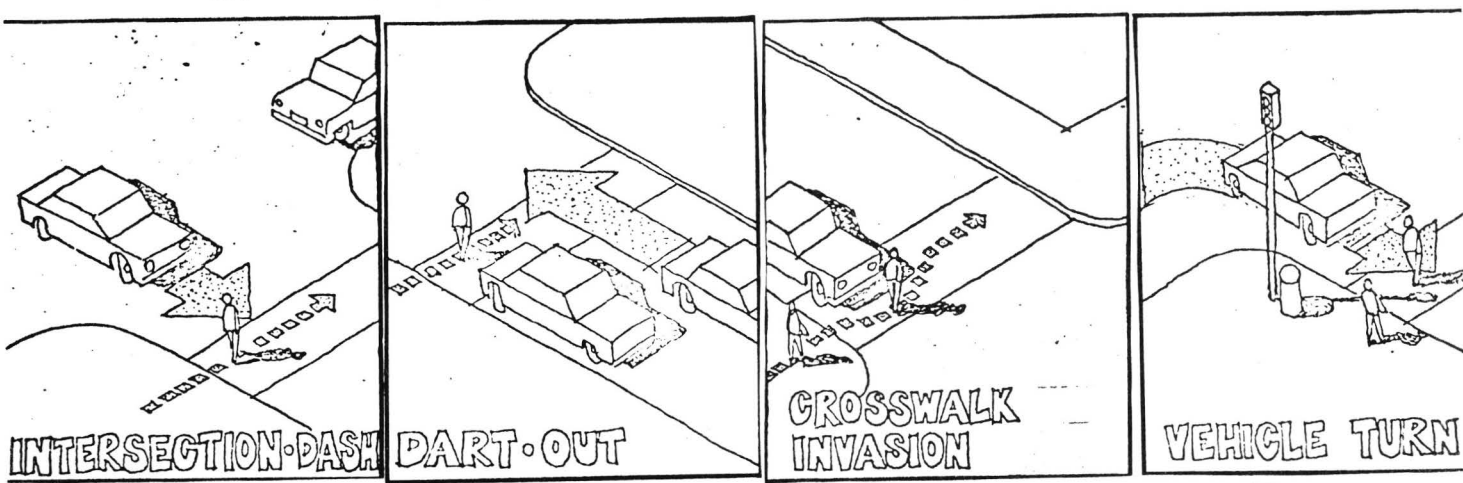
IF FACILITY SITE IS AT AN INTERSECTION:

25. Do you feel you had to wait too long at the traffic signal before crossing? Yes ☐ 1(84) No ☐ 2 (582) (TOTAL 666)

26. Did the traffic signal give you enough time to cross? Yes ☐ 1(540) No ☐ 2 (118) (TOTAL 658)

27. Did you have any problem with cars or trucks or other vehicles? Yes ☐ 1 (94) No ☐ 2 (570) (TOTAL 664)

28. If Yes, which picture is most like the problem you had:



☐ 1 ☐ 2 ☐ 3 ☐ 4

 Other (Specify)_____ ☐ 5

29. Do you have any problem understanding the WALK/DON'T WALK pedestrian signs?

Yes ☐ 1 (23) No ☐ 2 (593)
(TOTAL 616)

30. If Yes, what are they?_____

_____

31. Did walking through the intersection seem comfortable? Yes ☐ 1 (601) No ☐ 2 (62)
(TOTAL 663)

32. If No, did any of the items below make you feel uncomfortable? (Check)

Too narrow a crosswalk	☐ 1	(0)
Crowded sidewalk while waiting	☐ 2	(6)
Curbs	☐ 3	(3)
None of the above	☐ 4	(1)
Other_____	☐ 5	(34)

(TOTAL 44)

BLOCK 4: ENVIRONMENT

33. From the list below, select the items you consider made this walk pleasant.

Clean	☐ 1	(176)	
No noise	☐ 2	(37)	
Clear air	☐ 3	(117)	
Shops & browsing	☐ 4	(183)	
Benches for resting	☐ 5	(98)	
Rest rooms	☐ 6	(20)	
Protection from sun and rain	☐ 7	(96)	
Flowers & trees	☐ 8	(269)	
General appearance	☐ 9	(195)	
Safe from vandalism	☐ 10	(62)	
Nothing in particular	☐ 11	(102)	
Other (Specify)_____	☐ 12	(21)	

(TOTAL 1,376)

34. From the scale of 1 to 4 below, rate the items you selected as to their degree of pleasantness.

(1)	(2)	(3)	(4)
Slightly Pleasant	Moderately Pleasant	Pleasant	Very Pleasant

List Code (Question 33)

1	2	3	4
8	28	70	70
3	3	14	12
3	14	51	49
14	43	84	42
7	8	44	39
2	2	11	5

Scale Code (Question 34)

1	2	3	4
8	25	38	25
11	39	83	136
11	33	88	63
3	9	15	35
101	0	1	0
2	0	14	5

35. From the list below, select those items, if any, that you feel made this walk unpleasant:

Dirt and litter	☐ 1	(120)	
Noise	☐ 2	(221)	
Polluted air/smog	☐ 3	(92)	
Lack of shops or browsing	☐ 4	(12)	
No benches or rest places	☐ 5	(29)	
No rest rooms	☐ 6	(40)	
Steps	☐ 7	(7)	
No protection from sun and rain	☐ 8	(62)	
No trees or flowers	☐ 9	(34)	
General appearance	☐ 10	(28)	
Vandalism	☐ 11	(34)	
Nothing in particular	☐ 12	(306)	
Other (Specify)_____	☐ 13	(54)	

(TOTAL 1,039)

36. From the scale below, rate the items you just selected on a scale of 1 to 4 as to the degree of unpleasantness.

(1)	(2)	(3)	(4)
Very Slightly Unpleasant	Only Moderately Unpleasant	Unpleasant	Very Unpleasant

	List Code (Question 35)			
	1	2	3	4
1	8	37	35	40
2	19	77	52	65
3	8	17	25	42
4	2	3	5	2
5	5	9	6	9
6	9	7	9	16
7	3	3	1	2

	Scale Code (Question 36)			
	1	2	3	4
8	10	7	18	26
9	3	12	7	11
10	4	5	9	16
11	104	2	5	27
12	204	0	0	0
13	12	13	10	17

BLOCK 5: RESPONDENT DATA

Would you mind a few last questions? You will not be identified in any way and your answers will help us to better determine pedestrian needs.

37. Age Group:

14 or under ☐ *1* (26)
15 thru 24 ☐ *2* (354)
25 thru 44 ☐ *3* (243)
45 thru 64 ☐ *4* (162)
65 and over ☐ *5* (85)

(TOTAL 870)

38. Annual Household Income Group:

Under $3600 ☐ *1* (166)
$3600 to $7000 ☐ *2* (154)
$7000 to $10,000 ☐ *3* (134)
$10,000 to $15,000 ☐ *4* (142)
$15,000 to $25,000 ☐ *5* (97)
$25,000 and over ☐ *6* (36)
NA/DK ☐ *7* (124)

(TOTAL 853)

39. Which description best fits your occupation and work status?

Select One

Professional/Technical ☐ *1* (183)
Manager/Proprieter ☐ *2* (65)
Clerical/Sales ☐ *3* (228)
Craftsman/Foreman ☐ *4* (25)
Mechanic/Operator ☐ *5* (19)
Laborer ☐ *6* (62)
Service Worker ☐ *7* (77)
Student ☐ *8* (106)
Military ☐ *9* (7)

Select

Full Time ☐ *10* (520)
Part Time ☐ *11* (90)
Unemployed ☐ *12* (55)
Retired ☐ *13* (64)
Other: _____ ☐ *14* (41)

(TOTAL 1,501)

40. Sex: Male ☐ *1* (454) Female ☐ *2* (407) (TOTAL 861)

41. Race: White ☐ *1* (790) Black ☐ *2* (62) Other ☐ *3* (6)

42. Barriers:

Vision ☐ *1* (8) Walking ☐ *2* (13) Hearing ☐ *3* (3) Language ☐ *4* (2)

None ☐ *5* (829)

(TOTAL 855)

Describe barrier: _____

APPENDIX C

Results of Survey Pretest in Washington, D.C.

The survey questionnaire was first pretested on a very limited scale of approximately ten interviews on June 19, 1973 at Massachusetts Avenue and 17th Street, N.W., Washington, D.C. All survey questions, which related to trip data, pathway continuity and characteristics, traffic controls, orientation devices, environment, and respondent data, were asked of passing pedestrians. Pedestrians were quite amenable to being interviewed, although two interview refusals were made because of time constraints. The time required to complete all blocks was approximately 12 to 14 minutes during this mini-pretest, which was undertaken primarily to gauge the mechanics of recording pedestrian responses. Later, as our interviewers gained experience this time was reduced to eight minutes.

This preliminary pretest also enabled us to measure pedestrian understanding of the questions in the form in which they were asked. The following day, some minor language changes were made in preparation for the actual pretest which was conducted at two Washington location -- Connecticut and R Streets, N.W. on July 23rd and 24th, and 14th and F Streets on July 25th and 26th.

The Connecticut and R Street location is a mixed land use area with offices, apartments and houses, restaurants, and shops. Both Connecticut and R are major arterial routes for commuter and other traffic. R Street is one-way west-bound, while Connecticut is a major divided two-way arterial, with a large island midway which aids pedestrian crossings.

The 14th and F Street location, although primarily commercial, also has mixed land uses. A Barnes-walk traffic signal allows pedestrian-oriented traffic movements at this intersection. This intersection also abuts the pedestrian-oriented F Street Mall which extends between 12th and 14th Streets. Both intersecting roadways at this location have two-way vehicular traffic flow.

Parking facilities and bus stops exist at both locations.

Approximately 390 interviews were conducted at these locations over the four-day period. Testing, which included timing, was made of both individual question and the total questionnaire form. Based on the pre-test success of the interviewers in reducing the time required for the interviews and on the willingness of the interviewees to respond to the questionnaire, it was decided that information on all survey blocks would be sought in the forthcoming interviews in the survey cities.

A combined total of interview responses at both Washington, D.C. pre-test locations indicated the following selected results:

1. The predominant number of pedestrians (61 percent) chose the route on which they were walking because they considered it to be the "shortest . . ." route.

2. A comparable percentage of walkers felt that walking was the only means of transportation available to them for the trip they were taking because that trip was too short.

3. Respondents were almost evenly divided when asked "Would improved walking conditions encourage you to make more walking trips?", with 53 percent responding "yes", and 47 percent no.

   However, practically no respondents identified the type of walking improvement that would encourage them to walk more.

4. An appreciable minority of pedestrians expressed discontent with traffic signals: 21 percent replied "no" to the question "Did the traffic signal give you enough time to cross?"

   26 percent had a problem with cars or trucks or other vehicles. Of those 26 percent, 46 percent found vehicle invasion into the crosswalk a problem,

5. Characteristics of the respondents giving the above responses were:

   12% Under $3600
   12% $3600 through $7999
   17% $8000 through $10,999
   20% $10,999 through $15,999
   20% $16,000 through $25,000
   18% Over $25,000

Detailed analysis was not completed of the pre-test (e.g., stratification by trip purpose or by age group) for it was believed that the Washington, D.C. data could not be compared to the other survey cities because of language and question changes in the survey instrument. Moreover, changes were made in questions during the four-day pre-test as the interviewers revealed variations in interviewee understanding of questions. As language changes were made to eliminate these misunderstandings, the potential for distortions in Washington pre-test responses and results was increased.

Appendix D

Pedestrian Survey Sample and Total Population Characteristics of Lincoln, Nebraska and Sacramento, California

	Lincoln, Neb.				Sacramento, CA			
	Total Population		Pedestrian Survey Sample		Total Population		Pedestrian Survey Sample	
	No.	%	No.	%	No.	%	No.	%
Population	149,518	100%	400	100%	254,413	100%	485	100%
Age Groups:								
younger than 15		25%	13	3%		27%	13	3%
15-24		25	188	47		17	166	35
25-44		22	92	23		23	151	32
45-64		18	74	19		23	88	19
65+		10	32	8		11	53	11
Personal Household Income								
less than $3600		9%	70	18%		12%	96	21%
$3600-7000		18	70	18		20	84	19
$7000-10,000		24	56	14		23	78	17
$10,000-15,000		29	65	16		20	77	17
$15,000-25,000		16	41	10		15	56	12
$25,000+		4	21	5		2	15	3
No Response			74	19			50	11
Sex								
Male		48%	195	50%		48%	259	51%
Female		52	194	50		52	213	49
Race								
White		97%	376	96%		81%	414	88%
Black		2	12	3		11	50	11
Other		1	2	1		8	4	1

APPENDIX E

Percent Distribution of Work Trips in Lincoln and Sacramento by Mode of Travel *

Mode of Travel	Lincoln, Neb.		Sacramento, Ca.	
	Total no.	% of total	Total no.	% of total
Private auto or taxi	54,679	81%	79,891	85%
Bus	2,514	4	4,941	5
Walk only	6,215	9	4,452	5
Other means	1,763	3	2,806	3
Work at home	1,964	3	1,871	2
All Workers	67,135	100%	93,961	100%

*These data pertain to the administrative city units of Lincoln and Sacramento.

SOURCE: 1970 U.S. Census, General Social and Economic Characteristics.

PEDESTRIAN NEEDS AND ACCOMMODATIONS STUDY

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