TELEPHONE CONTACT AS A METHOD FOR GATHERING DATA ON EVERYDAY BEHAVIOR OF NONINSTITUTIONALIZED ADULTS

A Thesis

Presented to

the Faculty of the Department of Psychology

University of Houston

In Partial Fulfillment

of the Requirements for the Degree of

Master of Arts

By

Mary Lou Widmer

Fall, 1978

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ABSTRACT

Considerable work has been done on techniques for monitoring behavior. Although a self-recording technique has been shown to be reliable over many occasions, it is not practical for monitoring in the community environment over long periods of time. The present study develops and tests two telephone interview procedures against a self-recording diary technique. Eleven spinal cord injured persons and eleven nondisabled persons varying in age, sex, marital status, school and job responsibilities, reported daily activity data, including other persons involved and settings, over a 6 week period using the various collection methods. Rehabilitation professionals developed a set of activity codes based on the actual reported data.

Findings from multi-trait/multi-method matrices demonstrated convergent and discriminant validity. Analyses of variance and correlations on derived frequency measures showed a high level of agreement between data collection methods, and application of Tilton's overlap provided evidence of no difference between the diary and telephone interview methods.

Elapsed time was calculated and summed for each occurrence of each of the activity, person and location codes separately for every subject. This was done for each of the data collection procedures. Comparisons between diary and evening interview as well as comparisons between diary and midday+evening interview showed high correlations for these elapsed time data. Overlap analyses confirmed that there were no differences between the diary and interview methods.

In summary, the telephone interview approach to gathering community behavioral data agrees strongly with a previously tested self-recording diary approach. The telephone interview has the important advantage of relieving the subject of responsibility for his own data collection, thus enabling a researcher to gather consistent behavioral data from subjects over long periods of time. Finally, the telephone interview method is easy and inexpensive to use, and has shown good generalizability across types of persons and settings.

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CHAPTER I

INTRODUCTION

This study evaluates a method of gathering behavioral data on spinal cord injured persons who have been discharged from an institutional setting as well as on nondisabled persons living in their home environments. It employs an efficient technique intended to put the major responsibility for data gathering on the investigator, not the subject. This telephone interview technique will be compared with a self-report diary technique previously shown to yield good results (Kalb, 1971; Kirksey, 1973; Ronnebeck, 1972; Stuart, 1973). Specifically, the all-day diary will be compared to the evening telephone interview and also to the midday plus evening telephone interview to determine which generates closer agreement with the self-report diary method.

Background

Each year, between 6,000 and 10,000 persons in the United States suffer spinal cord injuries, becoming paraplegic or quadriplegic (Carter, 1977). Automobile and sport related accidents as well as gunshot wounds are the most frequent causes (O'Connor & Leitner, 1971). Depending on the exact point of injury, sensory or nerve function and muscle control may be lost from waist level down, from chest down, or perhaps from neck down. Although some nerve sensation and muscle control may return with time, the spinal cord injured person usually experiences significant decrements in his or her performance levels.

Until the 1950's, nearly all medical attention was focused on preventing death due to urinary complications, decubiti (pressure sores on the skin), pulmonary difficulties, etc. (Maxwell, 1971). As medical techniques became more refined and knowledge increased, however, the focus shifted somewhat to include questions about the quality of life that a spinal cord injured person could and perhaps should expect once he overcame major medical problems.

A person who has just suffered a severe spinal cord injury experiences a catastrophic decrease in his behavioral repertoire. From the onset of his injury, the patient progresses through a long period of bodily adjustment. Whereas before his injury he had taken for granted everyday behaviors such as brushing his teeth, eating, writing, washing, and scratching his nose, now these behaviors are often lost to him or drastically curtailed, as he finds himself without full use of his extremities.

Upon injury, a person initially finds himself dependent on others to carry out nearly all of his behaviors; he is often completely immobilized for several weeks after his injury and at the beginning of his hospital stay. Later, he must gradually undergo weight bearing programs until he is able to sit or stand erect without fainting or feeling nauseous. Finally, he is able to practice daily activities such as transferring himself into bed and combing his hair, using alternative muscle groups and building up weakened muscle tissue.

Mainly, rehabilitation hospitals focus their efforts on bringing the spinal cord injured patient as close as possible to his pre-injury levels of functioning, their goals being stated in performance levels. The overall aim is to make the patient maximally independent of aid by others.

During the patient's stay in a rehabilitation hospital, many routine physical maintenance measures such as blood pressure, temperature, urine analysis, etc., are obtained. In addition, hospital staff use behavioral measures to assess the patient's performance-on-demand. Measurements of activities of daily living (ADL) are widely used to measure functional performance in disabled persons (Dinnerstein, Lowenthal & Dexter, 1965; Donaldson, Wagner & Gresham, 1973). A measurement of ADL assesses the person's ability to transfer by himself, feed himself, groom himself, and perform other daily activities when asked. These task evaluations usually occur at the beginning of a patient's rehabilitation, just prior to his discharge, and often somewhere near the middle of his hospital stay. Their purpose is to assess the level of independent functioning that is possible for the patient. What he <u>can</u> do, however, is often different from what he regularly <u>does</u>, both during his hospital stay and, more importantly, once he returns home (Willems & Halstead, 1978).

Although the rehabilitation process begins in the hospital, it does not end with the patient's discharge. Rather, it continues and expands as the expatient tries his newly learned behaviors in the face of the complexities of the outside world, its barriers, its inducements, and its demands. After about three or four months of intensive therapy, the patient is able to leave the hospital environment, hopefully having learned a new set of skills for coping with day-to-day events. Although the rehabilitation program's effect on the patient is monitored continuously while the patient remains in the hospital, once he leaves, most hospital contact is severed, with the exception of periodic outpatient examinations and troubleshooting when necessary.

There are various theories of how long and difficult the road to complete rehabilitation is. Cogswell (1968) found a time course for paraplegics to reintegrate themselves into their home community, beginning at first with a small range of social contacts and settings, then expanding to an increased use of community settings and development of new social relationships. She stressed the need for maintaining frequent contact with expatients during the transition period to monitor rehabilitation trajectories and provide feedback to medical team personnel.

In their text, Adjustments to Physical Handicaps and Illness, Barker, Wright, Myerson and Gonick (1953) surveyed the rehabilitation literature and found huge inadequacies in the data on what people actually do, the style of life they lead once they leave a hospital environment. In gathering such behavioral data on expatients, it is important to cast a wide net so as not to misrepresent the complexities and interdependencies of spinal cord injury rehabilitation as it occurs in the patient's home community.

Willems (1976a) has written of the need to be aware of complex, long term, molar interdependencies between the organism and its environment. As a behavioral ecologist, he is acutely concerned with the distribution of phenomena in nature--the frequency and setting dependent nature of behavior. He realizes the complexity of such behavior-setting interdependencies, but feels the study of the human condition can abide no less. "Simple ideas and simple findings seem to be easier for us to comprehend and embrace than complex ones that may be much more appropriate" (Willems, 1976b, p. 212).

The best way to gather such full spectrum data is to sample the behavior as it occurs in context over time with as little intrusion as possible by the investigator. In this way, the behavior-environment

linkages are preserved, and small increments of change occurring steadily over long periods of time can be documented.

This focus on behavior-environment observed over time is central to this study. The gathering of community based behavioral data on severely disabled persons can shed light on coping strategies involving problems with architectural barriers such as steps, curbs and narrow doorways, social interaction difficulties, vocational and recreational activity levels, etc. These are patterns of person-environment interaction which usually change slowly over periods of months or years. Once these patterns of behavior are documented for spinal cord expatients, the rehabilitation hospital can add to, delete, or modify its treatment programs so as to better prepare the disabled person for the range and complexity of activities and environments he will encounter at home and in the community.

Behavioral Ecology and the Rehabilitation Setting

This study's aim is to develop and test a practical, reliable method of gathering ongoing contextual behavioral data without intrusion or intervention in its unfolding. The inherent complexity of documenting human behavior as it occurs over long time periods, e.g., one or two years, in the natural environment can most validly be represented by viewing the rehabilitation process through a behavioral ecology perspective since it incorporates the themes of behavioral complexity, person-environment interdependency, and the unfolding of patterns over long time periods (Alexander, Dreher & Willems, 1976; Willems, 1976b; Willems & Campbell, 1975).

Behavioral ecology is a perspective or orientation in the study of behavioral relationships between living organisms and their habitats,

focusing on behavior-environment congruences. Willems has stated some of the central tenets of behavioral ecology (1977). He asserts that in behavioral ecology, the study of human behavior should take place at the appropriate level of complexity. This is found in the systems of relationships linking person, behavior, social and physical environment. Such behavior-environment systems have properties which unfold over time and cannot be understood piecemeal. In a similar vein, any tampering or intervention in such a system will alter the whole, producing unintended, sometimes harmful, effects. The primary challenge in the study of behavioral ecology is to achieve enough understanding of such systems to anticipate any potential effects from interventions. Although it is true that one of the goals of scientific research is to simplify events by discovering unifying principles, it may be, as Willems says, that "in the long run the most direct and efficient path toward scientific understanding of behavior will involve the timely recognition and acceptance of complexity within an ecological perspective" (Willems, 1977, p. 44).

The settings in which the expatient lives and learns outside the hospital are different in number and complexity from those found in a rehabilitation hospital. Likewise, personal interactions may assume a different aspect. In order to fully understand a person's behavioral trends once he leaves a hospital, it is necessary to have some description of his behavior-environment ties, to be aware of which behaviors occur with whom and in which settings, and to document any changes in such relationships over time.

Behavior-environment data to answer these questions can be gathered by many methods, but certain traditional methods of data collection seem to present some pitfalls. Questionnaires, for instance, can tap recollected behaviors and social interactions, but there often is the problem

of the subject's interpretation of questions, and the loss of additional, perhaps clarifying, information. Friends and family can be interviewed regarding a person's behavioral activities; however, this restricts data to those times when the individual is in their company, and still can at best only result in their second hand observations of someone else's activity. These observations, in turn, are likely to contain biases which will then distort the reporting of events.

Direct, continuous observation of behavioral activities can avoid some of the problems associated with interviews and questionnaires. In fact, this approach has been found to be highly accurate and reliable during the time of a patient's stay in a rehabilitation hospital (Bailey, 1978; Crowley, 1976; Dreher, 1975). However, the logistics of an observer approach to gathering noninstitutional information over long periods of time involving observation of intimate personal contacts and complex changes of setting would be monumental, and the effort involved and turn-around time for the data processing prohibitive. Not only is direct observation inconvenient, it is also costly. Additionally, some behaviors could be inaccessible to external monitoring, whereas the subject has complete access to all his behaviors (Kazdin, 1974).

The self-report diary is an obvious solution to some of these problems, and has been employed with good results (Kalb, 1971; Kirksey, 1973; Ronnebeck, 1972; Stuart, 1973). However, though a good instrument for short term usage (e.g., up to several months), the self-report diary has proved to be time consuming and irritating when used over longer periods of time, for instance, one or two years.

An example of this long term usage problem in self-report data collection occurred in the Spring of 1975 for the Behavioral Ecology Research

Team (BERT) while doing research on spinal cord injured patients at the Texas Institute for Rehabilitation and Research (TIRR) in Houston, Texas. The first expatient from TIRR to use the written self-reporting diary procedure refused to continue after he had completed 11 diaries, or about 4 months of data. It was evident that although the diary format was reliable, it was not practical for long periods of data collection. At this point, the investigator began to formulate the telephone interview approach to gathering daily activity data as an alternative method for generating accurate behavior-environment data on spinal cord injured patients once they leave the TIRR hospital environment and resume their home based lifestyles. With this approach, the initiative for gathering the data was removed from the expatient and placed on the research personnel. The telephone interview has most often been used in survey research (e.g., Groves, 1977). However, it was felt that the telephone interview approach could generalize to these circumstances where nonevaluative behavioral data were being gathered.

The expatient who had previously refused to continue with diary data on his activities agreed to try this new approach in the Fall of 1975. As of January 1978, he had delivered more than 2 years of telephone interview data. This telephone interview procedure continues to be the chosen method for gathering information on the activities of spinal cord injured persons after they leave TIRR.

The Research Context

This study took place within the framework of an ongoing ecological study, conducted by BERT, of the rehabilitation of spinal cord injured persons at TIRR, Houston, Texas. The BERT project concerns itself with obtaining accurate and reliable data on the actual behavior of spinal

cord injured patients at TIRR and when they return home. Behind the BERT project's work is the assumption that enhancing functional performance--its pace, diversity, effectiveness, and independence--is one of the primary goals of the rehabilitation program. It is the project's goal to select and develop clinically relevant indicators of patient progress. Once the best indicators have been established, the BERT project will work toward packaging the methods for dissemination to other health care professionals to use and apply themselves. In order to ascertain which in-hospital performance indicators are precursors of long term success in rehabilitation, it is necessary to follow the rehabilitation trajectory for as long as two years after injury. Only when there is a large pool of behavioral information on expatients can BERT begin to look for trends between actual out-of-hospital performance ability and previous in-hospital behaviors.

Naturalistic behavioral data, especially on disabled persons, are scarce. Rehabilitation professionals only have recourse to personal anecdotes, plus a few studies, to help them plan programs of treatment. This information, although at times quite insightful, is neither systematic nor quantifiable across patients. Even within the hospital environment, there is often a lack of agreement among the members of a professional team about how a patient is progressing in his rehabilitation program. Once the patient goes home, there is usually only a void or perhaps a few brief anecdotes brought back to the hospital when the expatient returns to pick up some equipment or visit a patient. This in no way can do justice to the complexity of daily home activities. Nor can it serve as a vehicle for accurate feedback to hospital personnel on the efficacy of their treatment programs.

Self-Report Behavioral Data

Studies utilizing the behavioral self-report mostly have been associated with treatment or assessment programs aimed at certain preselected targeted behaviors, such as smoking, eating, aggressive acts, etc. In this area of specified behavioral reporting, there are certain considerations revealed by the literature concerning reactivity of the method and its accuracy.

Nelson (1977) reports that subjects react to the valence of the reported behavior(s): positively evaluated behaviors tend to increase, and negative behaviors tend to decrease. She also reports on a study in which it was found that the greatest reactivity to self-monitoring occurred when only one behavior, rather than two or three, is being monitored. Kanfer (1970) reports that instructing the subject to make a report at the beginning of an unpleasant behavior increases reactivity by interrupting the sequence of a behavior chain--the subject can decide not to do the behavior, but substitute another, more desirable behavior. This finding is in agreement with another study by Frederiksen, Epstein and Kosevsky (1975) wherein continuous recording of a targeted behavior (cigarette smoking) throughout the day produced more reactivity than a nightly reporting of all the day's instances. Also, Broden, Hall and Mitts (1971) found that having an obtrusive self-reporting device visually present during performance of the behaviors increased reactivity.

The literature regarding the accuracy of self-report techniques does not generally address itself to "accuracy" in the strict sense, but rather to tests of interobserver agreement as one indicator of the accuracy of the data. However, agreement may not be a complete or pure measure of accuracy.

It has been found that subjects' awareness that there will be periodic external checks on their reporting is likely to increase their reporting accuracy (Lipinski & Nelson, 1974; Lipinski, Black, Nelson, & Ciminero, 1975; Nelson, Lipinski & Black, 1975). Reinforcements contingent on agreements between subjects in their reporting of behavioral events have been found to increase agreement (Fixen, Phillips & Wolf, 1972; Nelson, Lipinski & Black, 1976). Kanfer (1977) suggests that self-recording persons may tend to decrease or avoid recording responses for undersirable target behaviors. Nelson et al. (1976) found accuracy to be lower when the behaviors monitored were undesirable rather than desirable ones. Nelson (1977) hypothesizes that quantitative self-reports may be less subject to distortion than qualitative self-reports are, as is the case with independent observers (Kent, O'Leary, Diament & Dietz, 1974; Shuller & McNamara, 1976). Nelson and McReynolds (1971) suggest that even if self-recording is to some extent inaccurate, the reactive effects may be consistent over time. For experimental confirmation of this hypothesis, see studies by Broden et al. (1971), Fixen et al. (1972), Herbert and Baer (1972), and Lipinski and Nelson (1974). This finding, however, would still allow for an accurate assessment of change data. Studies on the effect of self-reports of targeted verbal statements such as, "you know," versus behavioral events suggest that the behavioral events are reported with greater accuracy than the verbal occurrences. It has been found that some accuracy in self-recording is necessary in order for there to be any occurrence of reactivity to the reporting technique (Peterson, House & Alford, cited in Nelson, 1977). Perhaps self-observation of behavior without self-recording of it would avoid some of the reactivity. Generally, higher accuracy as well as higher reactivity

seem to result from continuous self-reports which utilize a highly visible apparatus (Frederiksen et al., 1975; Mahoney, Moore, Wade & Moura, 1973).

Research Objectives

The primary objective of this study is to evaluate the procedural characteristics and reliability of a telephone interview approach designed to collect long-term behavioral data from disabled and nondisabled persons in their natural home environments. In order to accomplish this objective, the study assesses the agreement between two forms of data collection: the already validated self-report diary (Kalb, 1971; Kirksey, 1973; Ronnebeck, 1972; Stuart, 1973), and the telephone interview method. The major issue is whether the telephone interview method of collecting behavioral data is an accurate and reliable approach to collection of data outside the hospital. Its ease of application, its flexibility as a tool to collect various types of data, and its ability to generate reliable data over long time periods will enhance its future use as a tool for gathering data not only from spinal cord injured persons, but also from cancer patients, stroke patients, and various other disabled and nondisabled persons for whom behavioral data would provide new insights into old problems.

The specific objectives of this study include: (a) formulating and designing the telephone procedures for gathering post-hospital data on spinal cord injured persons, (b) developing a category system for activities based on rehabilitation professionals' sorting of the actual data, (c) assessing the agreement between the self-report diary method and the telephone interview methods of collecting behavioral data, and (d) using the resulting information to refine the telephone interview procedures.

CHAPTER II

METHOD

Subjects

For this study, a disabled person was defined as one who required a wheelchair, manual or electric, to transport himself around. A total of 22 persons participated in this study. Table 1 presents the demographic data. Eleven subjects were disabled to some degree: Three were paraplegic (having some loss of lower body and leg function); eight were quadriplegic (having some loss of arm function as well as lower body and leg function). Three of the disabled subjects were female, and eight were male. Six were single, living in their own homes or apartments, and five were married, living in their own homes. Five of these disabled persons worked at regular jobs, three attended college, two did both, and one did neither.

The nondisabled group of subjects consisted of five males and six females. Two of the group were single, and the rest were married. All lived in apartments or homes of their own. Two persons attended school, five worked, three both attended school and worked, and one did neither.

All the subjects participated on a voluntary basis after giving their signed consent. In summary, the subjects in this study were quite diverse in terms of vocation, sex, marital status, place of residence, and age, which ranged from 18 to 50.

TABLE 1

Demographic Data of Subjects

	DISABLED	NONDISABLED
Subject Numbers	01-11	12-22
Number Without Disability	0	11
Number of Paraplegics	3	0
Number of Quadriplegics	8	0
Number Male	8	5
Number Female	3	6
Number Single	6	2
Number Married	5	9
Number in Home or Apartment	6	11
Number in Facility Designed for Disabled Persons	5	0
Number Attending College	5	5
Number Working	7	8

Research Assistants

Eight research assistants handled the telephone interviews. Five were male and three were female. Five of the assistants were psychology graduate students at the University of Houston, two held full time jobs with Baylor College of Medicine, and one was an undergraduate at the University of Houston, majoring in business administration. Their ages ranged from 20 to the mid 30s. All of the interviewers received training over several days in the telephone interview procedures and were randomly assigned to two or three subjects from whom they gathered data throughout the study.

There were four regular coders in addition to the investigator to avoid individual bias in using the coding system. All were female, two were graduate students in psychology, two were undergraduate students, and one was a full time employee of Baylor College of Medicine. Their ages ranged from 21 to the mid 30s. The protocols (raw handwritten reports of subjects' behaviors given in their own words) were coded by these five coders. To assess intercoder reliability, five persons, three of whom were regular coders and two who were other volunteer graduate students, were informed of the coding procedures and coded a selected portion of the data.

Data Collection and Format

The behavioral data were secured from subjects by means of a self-recorded diary done by the subject throughout the day (D) or a telephone interview done once a day in the evening (Ie) or twice a day: midday+ evening (Ime). The self-recorded diary is an instrument for collecting

information on activities, people (included as assistants or companions), settings, and times. A sample diary sheet is displayed in Figure 1. A diary pad consisted of approximately 25 such pages, each containing five sections for reporting activity units, so that the subjects could write information covering five activities on an 8½ by 11 inch page. The spaces were large enough to allow for the larger writing characteristic of persons using an assistive device for writing. The subjects could list 125 separate activities using one pad. Two pads were given to each subject at the beginning of the study, and more were supplied as needed. The forms were to be taken wherever the subject went, and he or she was instructed to enter the information about an activity when the activity was finished. The subjects were given some examples of the level of reporting desired, e.g., eating lunch, bathing, ironing, doing school work, etc. They each went over a day's activities with the investigator so as to practice the reporting technique and familiarize themselves with the information units of time, activity, persons involved, and locations. The subjects used their own words to describe their activities, and clarification was the only reason to modify a subject's own word description.

Information was gathered as to activity beginning time (each new beginning time was the ending time for the previous activity), activity description, assistance if required, location, companions, and conversation for each molar activity the subject engaged in throughout the day. The subject was encouraged to make mental notes of times when he changed settings, for instance, leaving home for school or work. This would make it easier to recall times of activities which occurred between setting changes. Activity referred to what the subject was doing

D I A R Y F O R M

Beginning Time _____ Location _____

Activity _____ Companions _____

Execution of Activity: Without Assistance _____

With Assistance, give name _____ Conversation _____

Beginning Time _____ Location _____

Activity _____ Companions _____

Execution of Activity: Without Assistance _____

With Assistance, give name _____ Conversation _____

Beginning Time _____ Location _____

Activity _____ Companions _____

Execution of Activity: Without Assistance _____

With Assistance, give name _____ Conversation _____

Beginning Time _____ Location _____

Activity _____ Companions _____

Execution of Activity: Without Assistance _____

With Assistance, give name _____ Conversation _____

Beginning Time _____ Location _____

Activity _____ Companions _____

Execution of Activity: Without Assistance _____

With Assistance, give name _____ Conversation _____

Figure 1
Self-Report Diary Form

behaviorally, for instance, eating lunch, doing school work, writing a letter. The subject recorded at the molar level, not listing all the molecular subparts of an activity. Eating lunch, for example, was not to be broken down into cutting up the meat, putting on condiments, eating, using a napkin, etc. The minimum length of a molar activity was 5 minutes. Assistance referred to any help the subject received in carrying out an activity. Even if the aid was very brief, the subject was to list the persons who helped. Location referred to a short description of the places in which the activity occurred, such as kitchen, school classroom, sidewalk. At home, the actual rooms were to be listed; otherwise, the building was listed, for instance, post office, grocery store. All locations were to be listed for activities taking place over many locations, such as wheelchair transport from the driveway, along the sidewalk, and into a friend's yard. Companions referred to a listing of all the people within ordinary hearing distance of the subject during the performance of an activity. All assistants were listed as companions. Conversation referred to a listing of the different persons with whom the subject conversed during the activity. This would include those persons who just exchanged greetings with the subject in passing, as well as the companions who spoke with the subject during an activity. A complete set of definitions and rules for each of the information units can be found in Appendix A.

The telephone interview form contained spaces for the same information as the self-report diary: activity, persons involved as assistants, companions, or conversation partners, settings, and time. The format was slightly different, however, to facilitate quick notes by interviewers.

A sample of the telephone interview form is displayed in Figure 2. Columns (to enable, for instance, the use of ditto marks) and a larger number of units per 8½ by 11 inch page (thirteen full units) enhance a quick flow of verbal-to-written information.

These interview forms were used by the research assistants to write down the information given them by the subjects (who had practiced verbal renditions of a day's behavioral events with the investigator before the study commenced) during the scheduled telephone interviews. The research assistants were instructed as to the interviewing procedure, which consisted of exchanging a few preliminary warm-up pleasantries with the subject, followed by the questions: "When did you wake up this morning?" "What did you do then?" for the midday portion of the midday+evening interview and for the evening-only interview. The subject would then continue to relate the sequential behavioral events of his or her day. If he came to times where he could not remember something, the interviewer said, "Let's go on to whenever you can remember. We'll come back and try to fill in missing bits of information once we've finished going through the day's activities." The data were recorded using the subjects own verbal descriptions, without judgments or other changes by the interviewer except to clarify exactly what the subject was doing behaviorally. On the evening part of a midday+evening interview, the interviewer first asked the subject, "What did you do after our midday interview was over?" and then the subject continued through the day's events as above. When the subject finished relating all he could recall of the day's activities, the interviewer thanked him and wished him a nice day or evening and told him goodbye.

INTERVIEW FORM

Subject:

Date:

Code Day:

Midday Or Evening

TIME	ACTIVITY--WITH OR WITHOUT ASSISTANCE	LOCATION	COMPANIONS	CO

Figure 2
Telephone Interview Form

The research assistants practiced interviewing the investigator before the study began. A set of notes to serve as reminders was given each interviewer (Appendix B). Generally, the notes reminded the interviewer that the period of time to be covered was from 7:00 a.m. to 9:00 p.m., with a midday interview being done between 11:00 a.m. and 2:00 p.m., and evening interview to be done shortly after 9:00 p.m., each written out on separate forms. Also, the interviewer was reminded of the 5 minute minimum duration for activities which would include the recording of the telephone interview itself if it lasted 5 minutes or longer. Finally, the interviewer was reminded to note any reactions from the subjects about the study, but not to solicit or encourage any particular point of view.

The data collection period was 6 weeks long, and the different methods of data collection (self-report diary, midday+evening telephone interview, evening-only interview) were assigned dates and combinations so as to balance their occurrence as much as possible over the weekdays and weekend days across the 6 weeks. Figure 3 presents the various combinations and dates of collection.

In gauging the demands and opportunities offered by environments encountered in various days of the week, Mondays and Wednesdays seemed often to be alike in the kinds of pressures they exerted on a person's time commitments. Tuesdays and Thursdays looked similar for the same reasons--consider, for instance, the scheduling of a college student's classes. Fridays seemed less like other weekdays, especially as regards the opportunities for diversified activities which occur toward the late afternoon and evening hours. Likewise, Saturday exerts its own special influence on people's activities, as does Sunday (e.g., grocery shopping,

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week I			D/Ime		D/Ie	Ime	
Week II	D/Ie				Ime	D/Ime	
Week III		Ime		D/Ie		Ie	D/Ime
Week IV			Ie			D/Ie	Ie
Week V		D/Ime			Ie		Ime
Week VI	Ime			Ie	D/Ime		D/Ie

D=Self-report diary, covering entire day's activities
Ime=Midday+Evening telephone interviews, together covering entire day's activities
Ie=Evening telephone interview, covering entire day's activities

Figure 3
Data Combinations and Schedule of Collection Days

religious activities, group outings). Thus, the schedule was set up to sample each of the following five units equally: Monday/Wednesday, Tuesday/Thursday, Friday, Saturday, and Sunday.

There were four different combinations or arrangements of data collection methods: (a) an evening interview around 9:00 p.m., covering the entire day's activities (Ie), (b) a midday interview, covering the morning and early afternoon activities plus an evening interview, covering the rest of the afternoon and the evening activities (Ime), (c) a self-report diary, covering the entire day's activities, and an evening interview (D/Ie), (d) a self-report diary, covering the entire day's activities, and a midday+evening interview (D/Ime). Each of these four combinations of data collection methods occurred once on a Monday or Wednesday, once on a Tuesday or Thrusday, once on a Friday, once on a Saturday, and once on a Sunday. This schedule was the same for all of the 22 subjects.

The entire data pool comprised 660 protocols, each of which contained approximately 18 activity units (based on the average found by the investigator for a subset of the data). Thus, the total number of activity units (each containing information on time, activity, assistants, companions, locations and conversation) was determined to be approximately 11,880. Since the amount of raw data was so enormous, the time and effort involved in its coding and computerization was deemed prohibitive. It became necessary to choose a subset of this data for the analysis purposes of this study.

The first priority in choosing this subset of the data was to sample from weekday as well as weekend activities. Fridays encompass a wide

range of activities, from work and school related projects to evening parties, dinners, or late afternoon, informal get-togethers. Sundays include various weekend activities such as religious meetings, cleaning house, grocery shopping, hobbies, going to the beach, and so forth. It was decided that this subset of the data would completely satisfy the objectives of this study. Analyses were restricted to combinations D/Ime and D/Ie, which involved 176 protocols and about 3,124 activity units.

Category Development and the Coding Process

A discussion of the development of an activity category system is reserved for the section on results since it is a somewhat unusual approach. Likewise, the use of the coding system and its reliability across coders is also included in the section on results.

CHAPTER III

RESULTS

Categories and Coding

Establishment of Activity Categories

The locations which subjects listed were conventional in nature, such as church, office, bedroom, yard, grocery store. It was, therefore, quite easy to devise a set of location codes for this part of the data. A list of the location codes is shown in Table 2. The types of assistants and companions which subjects identified were likewise fairly straightforward. Subjects referred, for example, to husband, wife, parents, classmates, doctor, or attendant. A list of the codes for persons can be found in Table 3.

Activity descriptions were not as distinct or unambiguous as locations and persons were. There were 703 different activity descriptions culled from the entire data pool of thousands of daily activities (most of which were repetitions of other word descriptions) reported by all the subjects during the 6 weeks of the study. Some of these 703 activity descriptions, although verbally different, were conceptually somewhat similar, such as "taking a shower" and "bathing." Others were further apart, but still related, such as "cooking hamburgers" and "cleaning off the dinner table." Others were obviously distinct from one another, such as "writing a school paper" and "feeding the pets." Rather than arbitrarily devising a set of activity categories, the investigator decided to ask professionals in rehabilitation to create meaningful categories, using as a basis these 703 different word descriptions of activities actually reported by subjects during the study.

TABLE 2

Location Codes

RESIDENCE

01 Undifferentiated
02 Bathroom
03 Bedroom
04 Den; Family Room
05 Dining Room; Breakfast Room
06 Garage, Carport
07 Hallway in Home
08 Kitchen
09 Living Room
10 Office Area; Study
11 Around Home Areas (e.g., driveway, own parking space, yard, walkway, IH grounds, patio, washing/utility area)
12 Independence Hall Snackbar
13 Independence Hall Office Rooms; Lobby
14 Sewing, crafts, etc., workroom

TRANSPORTATION

20 Streets, Public Parking Lots and Garages
21 In the Air (airplane travel)

OTHER RESIDENCES

30 Relatives' Homes, Apartments
31 Friends'/Acquaintances' Homes, Apartments (e.g., Annex, friend's home area

WORK

40 Personal Office, Area of Employment

EDUCATION: UNIVERSITY OF HOUSTON

50 Personal Office (for graduate student doing school activities)
51 Classrooms
52 Hallways, Elevators, Lobbies
53 Other Offices; Meeting Rooms
54 Grounds of UH
55 University Center Area; Satellite Area
56 Library
57 Bathrooms
58 Snack Bars

TABLE 2

continued

SERVICES

65 Service Station, Auto Place
66 Hairdressers; Barber
67 Shopping Center Dept. Stores (e.g., Foley's, bookstore, florist)
68 Restaurant, Eating Places, TIRR cafeteria
69 Church, Temple
70 Convenience Store (e.g., 7-11)
71 Bank
72 Grocery Store (Weingarten's, Kroger)
73 Clinic Settings (e.g., Medical Center places, Ben Taub)
74 Professional Offices (e.g., lawyer's office, doctor's office)
75 Educational Settings (e.g., jr. high, day care center)
76 Airport Area, Bus Station
77 Washateria
78 Post Office

RECREATION

85 Museum, Art Gallery
86 Lounge, Private Club
87 Theater, Movie
88 Stadium, Astro Complex Areas, Hofheinz Pavillion
89 Park
90 Dance Studio
91 Theaters for the Performing Arts

99 No Data

TABLE 3

Person Codes

01	Spouse (or Roommate)
02	Children
03	Parent
04	Sibling
05	In-Law
06	Other Relatives
07	Attendant
08	Co-Worker; Classmate
09	Teacher; Professor
10	Persons served by one's profession (e.g., patients by a doctor; customers by a clerk)
11	BERT Personnel
12	Service Personnel (e.g., store clerk, secretary, bus driver)
13	Otherwise Unidentified Friend, Acquaintance (e.g., neighbor, Church acquaintance)
14	Medical Personnel (e.g., doctor, nurse)
15	Professional Service Personnel (e.g., lawyer, police, counselor)
16	Otherwise Unidentified Strangers; Unknown Persons
00	No One Assisted; No Companions
90	Irrelevant for Assistance (e.g., lying down, visiting, passive recreation)
99	No Data

An occupational therapist, physical therapist, social worker, and two nurses were each asked to sort the different activities obtained during the 6 weeks of the study in whatever way seemed most appropriate to them as professionals, and to give each of their sorted clusters of activities a descriptive label, e.g., mealtime activities, grooming activities. There was no attempt to force the various categories into the same conceptual level. "Studying" can consist of many individual but connected behavioral pieces, for instance, reading a book, writing notes, memorizing information; whereas, "wheelchair transport" basically occurs as one activity, making the wheels on the wheelchair revolve. The various professionals were given no instructions other than to cluster the activities in whatever way seemed most meaningful or appropriate to them. The investigator likewise clustered the activities. The major concern was to develop categories which would be of use to a variety of professionals in describing persons' daily activities in a community environment.

The clusters or categories generated by the professionals and investigator were then pooled into a comprehensive list of descriptive headings. This list of cluster headings was given to four professionals (the same physical therapist and one of the same nurses, as well as two new persons from occupational therapy and social service) along with the 703 subject-generated activities, and this new set of professionals (as well as the investigator) sorted all the activities into the clusters which were established during the previous step. When this was done, the investigator tested the agreement between sorters across the 703 activities as well as for each of the 703 activities across the sorters.

A weighted measure was used to examine the agreement among the sorters for each of the activity descriptions. If, for instance, all five sorters put an activity into the same category during their sorting task, the weighted agreement score would be 5 times 1 (activity), or a score of 5. Table 4 summarizes the results of the weighting process. Each of 412 activities were put into the same category by all five sorters (agreement equals 2,060). For an additional 148 activities, only four of the five sorters agreed that the item went into a certain category, for a weighted agreement of 592. Table 4 shows that there was complete agreement (100%) by sorters on 442 activity descriptions (412 plus 30). For 148 activities, there was 80% agreement. For an additional 10 activities, three of four sorters agreed, for a 75% agreement rate. Thus, for 600 of the 703 activity descriptions generated by subjects, there was at least 75% agreement. A total of 66 of the remaining 103 activities were agreed on by three out of five sorters. Only 37 activities presented real difficulties in that they were mutually sorted into a particular category by only two sorters. Many of these ambiguities came in the areas of fleeting communication versus social gatherings. Some sorters made judgments based on number of people present or seriousness of conversational content. For the final category descriptions, these two categories were separated into 15 minutes or less conversing (fleeting communication) and over 15 minutes conversing (social gatherings/visiting). Another area which appeared to cause trouble for sorters was the area of transporting activities versus other activities which by their nature include some transporting (e.g., walking around a shopping center, walking to class). The final list of categories included a separate category for shopping/obtaining goods and services. Home, yard and auto upkeep was broadened to

TABLE 4

Weighted Agreement Among Sorters

Across Activity Descriptions

Number of Activity Descriptions	Number of Sorters In Agreement	Number of Sorters Total	Weighted Agreement	Total Possible Agreement
412	5	5	2060	2060
148	4	5	592	740
30	4	4	120	120
66	3	5	198	330
10	3	4	30	40
35	2	5	70	175
2	2	4	4	8
703			3074	3473

include wheelchair upkeep, mending, and washing the car, rather than just cleaning and straightening up activities. Some problems were caused by the actual activity descriptions being ambiguous, for instance, "using tape recorder," which could be part of work, school, or recreation activities. The overall weighted agreement was determined by dividing the total possible weighted agreement (calculated as 100% agreement by sorters on all activity descriptions) into the sum of the actual weighted agreement scores, i.e., 3,074 divided by 3,473. This resulted in an overall agreement of 88.5%.

In order to obtain pairwise agreements between all sorters, a tally was made of all activities that any two sorters agreed upon. For instance, sorters 1 and 2 agreed on their categorization of 555 activities (out of the total of 703 activities). So, 555 was divided by the total possible number of agreements which was 703, resulting in an agreement for those two sorters of .79. This process was repeated for all pairs of sorters. The results are presented in Table 5. It is evident that with the exception of sorter 4, the agreement rates are very high. When asked for feedback about the task, this sorter said that she wished she had not taken on the extra work, but felt obligated once she began. She stated that she had exceptionally heavy work demands during this time. Since the activity item analysis had pointed the investigator to a few ambiguities in the sorting process (as noted above) which were then corrected, it was felt that the rates of pairwise agreement were sufficiently high to verify the efficacy of the category system. The revised final list of activity categories can be found in Table 6.

TABLE 5

Paired Agreement Between Sorters

on the Assignment of Category Labels

	1	2	3	4	5
1					
2	.79				
3	.89	.85			
4	.72	.69	.73		
5	.84	.81	.82	.72	

TABLE 6

Activity Categories

With Descriptive Information

01 Transporting Activities--by Vehicle
Ride or drive a car, plane, etc., with getting from one place to another as the major activity

02 Transporting Activities--by Wheelchair
Getting from one place to another using a wheelchair

03 Transporting Activities--Ambulatory
Walking from one place to another as the major activity

04 Leisure/Recreation Activities--Basically Idle
Recreational activities having little or no physical activity involved; e.g., sit and watch a movie, TV, a concert, listen to the stereo, play chess, meditate, read, look at pictures or recipes

05 Recreation/Play Activities--Physical Effort
Actively doing something or manipulating some object for enjoyment, as play a board game or cards, boating, walking through a museum (or wheelchairing), building a model plane, also tinkering with car, electronics, gardening, etc., IF designated as hobbies

06 Shopping/Obtaining Goods and Service Products
Obtaining such items as clothes, gifts, stamps, food, checks cashed, burger/fries, letters posted, gas in car, repaired items; but NOT including medical or professional aid (e.g., doctor, dentist, etc.)

07 Behaviorally Idle/Resting Activities
Sitting, lying down or standing, and not attending to anything in particular; NOT to include waiting in line for some other activity (movie, food); does include waiting for doctor, daughter, barber (sit and wait activities)

08 Employment Activities
Includes all parts of job/employment activities, such as meetings, presentations, writing reports, cleaning off desk

09 School Activities
Unpaid, school related activities, such as library research, studying, lecturing, practicums, seminars

10 Writing and Typing Activities--Nonemployment and Nonschool Related
Includes letters, cards, notes to self/others, checks or financial work, insurance forms, etc.

TABLE 6

continued

11 Meal and Snack Activities
Includes food preparation, setting table, cleaning up, as well as actual eating

12 Pet Related Activities
Includes feeding, grooming and cleaning up after, health care, and play activities, walking a dog, pulling a string for a cat, etc.

13 Intimate Sexual Behavior
Includes all sexually specific activities

14 Religious Activities
Attending religious activities such as church, sunday school, synagogue; but NOT to include such things as opening holiday gifts, attending a bazaar

15 Transfer Activities
Transferring oneself from one surface to another

16 Home/Yard/Auto and Wheelchair Upkeep
Maintenance types of activity, to include cleaning, washing, ironing, mending or sewing clothes, yard work, home arrangement, loading auto, putting things away, packing, washing car, getting mail from home mailbox, finding or gathering up items in or around the home

17 Fleeting Communication
Brief chats (15 minutes or less) in person or over the phone, but NOT as part of job or school work; e.g., when you accidentally meet a friend and chat briefly in the hallway or a parking lot

18 Visiting/Social Gatherings
Extended discussions (over 15 minutes) in person or over the telephone, but NOT as part of job or school work; e.g., talking over coffee in a friend's apartment, getting together with co-workers for drinks after work, having an argument with someone

19 Obvious Partying
Attending a party, usually accompanied by snacking or drinking, with the focus on socializing, NOT recreational activities such as poker, monopoly. Also, NOT arranged around eating a meal (e.g., dinner). For instance, NOT eating dinner with friends which would be coded "eating" with the appropriate accompanying information on companions

20 Grooming/Dressing/Health Care Activities Involving the Self
Includes bathrooming activities, setting one's hair, getting dressed, etc. Health care does NOT refer to activities with recreational components such as jogging, tennis, but would include exercising of particular muscle groups IF prescribed as part of medical treatment

TABLE 6

continued

21 Grooming/Dressing/Health Care Activities for Others
Assisting others (e.g., husband, wife, child) in their grooming, dressing or health care activities, to include nursing a baby, shampooing someone's hair, helping another to dress or medicate him/herself

22 Medical/Professional Aid Activities
Being given medical or professional assistance, such as seeing a doctor, optometrist, lawyer, psychiatrist, beautician, barber, etc.

23 Miscellaneous or Unspecified Activities
Used when lacking information mainly, e.g., goofing off, puttering around

24 Interview and Diary Activities
Includes all parts of keeping diary records and participating in telephone interviews for this study

88 Multiple Activities
Impossible to split multiple activities

99 No Data
Due to inability to contact subject for data

The Coding Process

Each individual handwritten protocol was identified with a unique code for subject number, date, type of combination and day (e.g., D/Ie-Friday), type of data (e.g., Ie). Samples from a subject's actual protocols, one from a self-recorded diary and the other from a telephone interview which overlapped in time, are displayed in Figures 4 and 5 to give an illustration of the handwritten data. With each coder individually, the investigator coded a set of activities using the activity, person, and location codes (Tables 2, 3 and 6), and the coder asked questions about any procedures of assigning code information which were confusing. Then, for the coding of the actual data, each coder was given a subject's handwritten protocol (chosen at random) to code. For this first protocol by each coder, the investigator went over the process with the coder to check on it as well as answer questions and give feedback. As the coders finished coding a protocol, they were given another one to code until the entire data pool was coded. The investigator was available during all the coding to answer any specific questions regarding problems of legibility or interpretation of a subject's description of what he was doing. After coding a few protocols, a coder would generally only question legibility, or noncontiguous activities. The coding process and category descriptions seemed to be fairly straightforward, and coders soon reported that they had memorized the most often used codes.

Reliability of the Coding Process

In order to evaluate the coding system, it was necessary to compile a subset of the data which would represent the subject characteristics

DIARY FORM

Beginning Time 3:15 Location VA Office

Activity Write diary form Companions —

Execution of Activity: Without Assistance ✓

With Assistance, give name —

Conversation —

Beginning Time 3:25 Location VA → Home

Activity transport (car) Companions student (A.B.)

Execution of Activity: Without Assistance ✓

With Assistance, give name —

Conversation AB

Beginning Time 4:10 Location living room

Activity relax - read paper + T.V. Companions —

Execution of Activity: Without Assistance ✓

With Assistance, give name —

Conversation —

Beginning Time 5:20 Location porch

Activity talk with neighbors Companions neighbor's wife

Execution of Activity: Without Assistance ✓

With Assistance, give name —

Conversation M.W.

Beginning Time 5:30 Location living room

Activity Watch TV. Companions wife

Execution of Activity: Without Assistance ✓

With Assistance, give name —

Conversation wife

Figure 4
Sample of Filled Out Diary Form

INTERVIEW FORM

Subject: 14

Date: 1107

Code Day: D/E

Midday Or Evening: E

:	ACTIVITY--WITH OR WITHOUT ASSISTANCE	LOCATION	COMPANIONS	CONV.
0	fill out diary	Office	Baine	~ yes
5	trgt home	Sts.	—	Student (boring)
0	read paper / T.V.	liv	—	—
0	talk w/ neighbors	porch	J., neigh.	both
0	T.V.	liv.	J	J
0	cook dinner & T.V.	Kit	J	J
30	Eat " "	liv	"	"
5	T.V.	"	"	"
5	telecon in	"	"	hyp
0	T.V.	"	"	J.
0				

Figure 5
Sample of Filled Out Telephone Interview Form

such as sex or disability status, as well as the various types of data collection and dates, i.e., midday+evening interview (Ime), diary (D), evening interview (Ie), Friday, Sunday. First, the investigator assembled a full sample of data collection methods and dates. Then, subject characteristics such as sex, disability, vocation and school status were distributed across the sample of data collection methods and dates, resulting in the final assemblage of sets presented in Table 7. Five sequential activity units were chosen from each of the resulting protocols with the aim of giving as much diversity in coding categories as possible while keeping the actual coding process similar to the rest of the study. This resulted in the 40 activity units in column 6 of Table 7--approximately two days worth of data. Each of the eight sets had five sequential activity units to preserve as much as possible the sequential nature of the recording process.

Three of the five coders in the study helped with this additional test of intercoder agreement. Two graduate students took the places of the other two unavailable regular coders. The two new coders were then introduced to the coding system by the investigator. It was felt that by keeping brief this period of instruction to the untrained coders, the various pairwise comparisons would show to what extent training, feedback and practice would enhance agreement for this coding system. The three regular coders plus two new coders each coded the 40 activity units independently. Each pair of coders (ten paired comparisons) were then compared as to their agreement in listing activity categories, person categories, and location categories. Table 8 displays the various paired agreement rates. Coders 1, 3, and 5 were the three regular coders in the

TABLE 7

Characteristics of Data Set for

Coder Reliability Analysis

Disability Status	Sex	Type Data Fri-Sun	Data Collection Combination	Protocol	Activities
Nondisabled	Fem	Sun, 11/23	D/Ime	D	4-8
Nondisabled	Male	Fri, 11/7	D/Ie	D	9-13
Nondisabled	Fem	Sun, 12/7	Ime	Im	11-15
Nondisabled	Male	Fri, 12/5	Ie	Ie	6-10
Disabled	Fem	Sun, 11/23	D/Ime	D	12-16
Disabled	Male	Fri, 11/14	Ime	Im	10-14
Disabled	Fem	Fri, 12/5	Ie	Ie	4-8
Disabled	Male	Sun, 12/14	D/Ie	D	2-6

TABLE 8

Paired Coder Agreement Rates for

Sample of 40 Activity Units

Activities

	1	2	3	4	5
1					
2	100				
3	100	100			
4	.90	.90	.90		
5	100	100	100	.90	

Assistants

	1	2	3	4	5
1					
2	.86				
3	100	.86			
4	.90	.86	.90		
5	100	.86	100	.90	

Companions

	1	2	3	4	5
1					
2	.97				
3	.98	.97			
4	.94	.91	.93		
5	100	.97	.98	.94	

Locations

	1	2	3	4	5
1					
2	.80				
3	.90	.82			
4	.78	.79	.84		
5	.86	.90	.92	.81	

study; coders 2 and 4 were the briefly trained graduate students. Agreement between pairs of coders was calculated on the basis of the number of units agreed on (categories) divided by the total number of units. For example, 30 agreements on category labels out of a total of 40 units given to be coded would result in .75 agreement between two coders for activities.

Table 8 shows that for activity categories, agreement ranged from 90% to 100%. This was a clear demonstration that the category system derived from the professionals' clustering of items was reliable for different coders. Assistant agreement ranged from 86% to 100%, companion agreement ranged from 91% to 100%, and location agreement ranged from 78% to 92%. (Conversation listings were found to correlate almost perfectly with companion listings, and were therefore eliminated from further analyses.) Location codes were lowest, and the data were examined to ascertain why this was so. Several points emerged. First, molar activities occurring over a long period range over many settings from all the rooms in a home to hallways, college grounds and parking lot, etc. The investigator had decided to limit the number of locations recorded to three, and some instances of disagreement involved the choosing of a different group of three by two coders from a total of four or five possible locations. Another cause of disagreement was some overlap in the codes for place of employment and clinic settings for some of the subjects (e.g., one subject was employed part of the time at a clinic setting where he also went for school related work and to visit friends) which confused those coders unfamiliar with the subjects' particular arrangements. This was especially true for the inexperienced coders.

Derived Measures

Six basic areas of information were sampled during the study: time, activity, assistance, locations, companions, and conversation. As noted previously, conversation, with its "some" or "none" nature, did not seem to generate a separate unit of information, but rather to be a redundant measure of companions. In fact, some interviewers just put a check in the conversation column whenever companions were noted. They reported that subjects said they probably talked with everybody at one time or another during the activity. Thus, conversation was dropped from the analyses to conserve on the number of analyses to be performed, and to reduce the likelihood of a chance occurrence being found statistically significant.

Derived information involved measuring total units per measure (e.g., total number of activities) and different kinds of units per measure (e.g., number of different activities) for all subjects. Two correlation matrices were calculated involving all the above derived measures. One matrix involved the D/Ime data, and the other utilized the D/Ie data. The actual measures are abbreviated as follows:

TA	Total number of activities
TUA	Total number of unassisted activities
TC	Total number of companions listed
TNH	Total number of nonhome locations listed
NDA	Number of different activities
NDAS	Number of different assistants
NDC	Number of different companions
NDNH	Number of different nonhome locations

Total number of unassisted activities (TUA) was chosen as a measure rather than its converse, number of assisted activities. For spinal cord disabled subjects, unassisted activity is a goal of rehabilitation.

Total number of activities done outside the home area (TNH) and number of different nonhome locations (NDNH) were chosen as the more sensitive indicators of differences in subjects' range of settings, since potential number of home locations, such as yard, den, sewing room, varied from subject to subject, and differences between subjects might then be due to different types of home dwellings, e.g., apartment, home, duplex, rather than to actual number or range of different settings utilized by subjects. Again, this was a particularly interesting measure to validate for disabled persons, who are trying to reintegrate themselves into the community.

Tables 9 and 10 present the correlation matrices--multi-trait/multi-method matrices. Discriminant validity may be assumed if correlations among different methods (modes) for the same measures are greater than the correlations for various measures generated by the same mode and for various measures generated by various modes (Campbell & Fiske, 1959). To explain further, it was hoped that each measure (e.g., number of unassisted activities) gathered by the diary mode would correlate highly with that measure gathered by telephone interview mode. Looking over Tables 9 and 10, it can be seen that this indeed is so--the diagonal coefficients of the lower left square of coefficients range from .86 to .98, with the exception of number of different activities on the D/Ie matrix (r=.75). The average correlation for the D/Ime data is .92; for the D/Ie data, .90.

Next, different measures obtained by the same mode might be expected to correlate higher than different measures obtained through different modes, depending on how similar the modes were. Looking at the correlation matrices for different measures/same mode (upper left and lower right

TABLE 9

Correlation Matrix for

D/Ime Data Comparison

	D I A R Y								MIDDAY+EVENING INTERVIEW							
	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16
	TA	TUA	TC	TNH	NDA	NDAS	NDC	NDNH	TA	TUA	TC	TNH	NDA	NDAS	NDC	NDNH
DIARY																
V1 TA																
V2 TUA	.74															
V3 TC	.53	.49														
V4 TNH	.33	.26	.46													
V5 NDA	.38	.50	.31	.35												
V6 NDAS	.13	-.32	.03	.16	-.15											
V7 NDC	.18	.49	.10	.47	.52	-.13										
V8 NDNH	.23	.50	.39	.66	.24	-.05	.64									
M+E INT																
V9 TA	.97	.77	.53	.31	.42	.05	.16	.25								
V10 TUA	.71	.95	.57	.22	.44	-.28	.41	.49	.75							
V11 TC	.64	.52	.86	.26	.15	.02	.03	.16	.66	.61						
V12 TNH	.34	.26	.48	.98	.38	.13	.44	.65	.35	.25	.30					
V13 NDA	.57	.66	.42	.38	.88	-.03	.40	.34	.62	.63	.27	.42				
V14 NDAS	.08	-.42	-.03	.16	-.15	.87	-.23	-.11	.01	-.44	-.10	.16	-.09			
V15 NDC	-.01	.31	.07	.34	.38	.00	.88	.53	-.07	.23	-.01	.29	.21	-.11		
V16 NDNH	.21	.46	.40	.64	.28	-.06	.63	.96	.27	.47	.18	.68	.36	-.05	.50	

TABLE 10

Correlation Matrix for

D/Ie Data Comparison

	D I A R Y								EVENING INTERVIEW							
	V1 TA	V2 TUA	V3 TC	V4 TNH	V5 NDA	V6 NDAS	V7 NDC	V8 NDNH	V9 TA	V10 TUA	V11 TC	V12 TNH	V13 NDA	V14 NDAS	V15 NDC	V16 NDNH
DIARY																
V1 TA																
V2 TUA	.79															
V3 TC	.75	.62														
V4 TNH	.42	.17	.40													
V5 NDA	.61	.61	.52	.27												
V6 NDAS	.10	-.39	.14	.43	-.05											
V7 NDC	.22	-.04	.22	.62	.44	.48										
V8 NDNH	.31	.21	.21	.84	.33	.33	.52									
M+E INT																
V9 TA	.87	.70	.52	.22	.52	.08	.13	.19								
V10 TUA	.75	.95	.52	.09	.57	-.37	-.11	.20	.80							
V11 TC	.78	.70	.94	.32	.54	.07	.18	.19	.69	.65						
V12 TNH	.36	.12	.34	.97	.25	.45	.61	.83	.27	.10	.30					
V13 NDA	.60	.54	.31	.26	.75	.09	.33	.33	.78	.66	.44	.36				
V14 NDAS	.03	-.49	.06	.37	-.13	.89	.48	.21	.06	-.47	-.02	.42	.10			
V15 NDC	.31	.07	.24	.66	.44	.43	.91	.57	.24	.04	.26	.65	.35	.34		
V16 NDNH	.27	.22	.17	.79	.28	.29	.48	.95	.19	.22	.15	.80	.35	.17	.52	

triangles), it can be seen that the average correlation for diary obtained measures in the D/Ime matrix was .34. For the midday+ evening data in the D/Ime matrix, the average correlation was .32. In the D/Ie matrix, the average correlation for the diary data measures was .39; for the evening interview measures it was .37. Next, looking within the square (lower left of the matrix) at all but the diagonal coefficients, we have the correlations for different measures/different modes. The average correlation for the D/Ime data was .33, and for the D/Ie data it was .36. Another way to look at this comparison of different measures/same mode and different measures/different modes is to take a percentage of the correlations which are lower in the latter case than the former case. For instance, in Table 10 the V4(TNH)-V6(NDAS) same mode correlation coefficient is .43, and the V4(TNH)-V14(NDAS) different mode correlation coefficient is .37. The number of such lower correlations is then divided by the number of lower plus higher correlations to give a percentage result. When this was done, it was found that in 70% of the cases for the D/Ime data, the different measures/different modes correlation coefficient was lower than the different measures/same mode correlation coefficient. For the D/Ie data the figure was 68%.

In summary, correlations between modes for the same measure were very high; between measures within one mode, much lower; and between measures between modes, slightly lower still. This was good evidence that the different derived measures did, in fact, measure different types of information, and that the different modes (i.e., diary, evening interview, midday+evening interview) generated the same types of data in similar

quantities. These findings are indicative of convergent and discriminant validity as defined by Campbell and Fiske (1959).

Correlations for Frequency Data

Analyses of frequency measures made up a large portion of the statistical tests which were performed. The other portion consisted of analyses of duration (elapsed time) measures. Table 11 presents the correlations between frequency measures obtained through diary versus telephone interview techniques. With the exception of two cases, the correlations were all above .85. In the case of number of different assistants under the D/Ime comparison, the correlation was .83, and in the case of number of different activities under the D/Ie comparison, it was .75. The consistently high correlations show that there is a direct relationship between the measures as obtained by diary and by telephone interview.

Between Measures Comparisons for Frequency Data

Although the correlational analyses proved that there was a high level of association between the diary and interview methods of collecting behavioral data, they had not established the level of agreement between the absolute frequencies generated by the various modes. Thus, the investigator decided to calculate some preliminary t-tests for correlated measures to test for significant mean differences which may have existed between the data collection methods. Table 12 displays the correlations and t-test results of this preliminary set of analyses. After completing this first set of calculations, the investigator determined to plot the data in a scatterplot so as to be able to visually inspect the mode differences. Figure 6 presents a scatterplot for the measure, total number of unassisted activities. The data are those from the D/Ie data days on

TABLE 11

Correlations for Derived Frequency

Measures Between Modes

	r=	
	D/Ime	D/Ie
Total Number of Activities	.97	.87
Number of Different Activities	.88	.75
Total Number of Assisted Activities	.87	.89
Number of Different Assistants	.83	.89
Total Number of Unassisted Activities	.97	.95
Total Number of Companions Listed	.86	.94
Number of Different Companions	.91	.88
Number of Different Unrelated (non-Attendant) Companions	.94	.86
Total Number of Nonhome Locations Listed	.98	.97
Number of Different Nonhome Locations	.96	.96

TABLE 12

Preliminary Statistics for

Several Frequency Measures

	Nondisabled Subjects		Disabled Subjects	
	D+Ime	D+Ie	D+Ime	D+Ie
Frequency of Activities (01-25)	r=.995 t=sig**	r=.996 t=n.s.	r=.988 t=n.s.	r=.968 t=n.s.
Frequency of Assistants (01-16)	r=.991 t=n.s.	r=.985 t=n.s.	r=.981 t=n.s.	r=.975 t=n.s.
Frequency of Activities Unassisted (01-20)	r=.996 t=sig**	r=.992 t=n.s.	r=.978 t=n.s.	r=.967 t=sig**
Frequency of Locations (01-50)	r=.995 t=n.s.	r=.995 t=sig***	r=.993 t=sig***	r=.990 t=n.s.

*p < .10

**p < .05

***p < .01

(two-tailed)

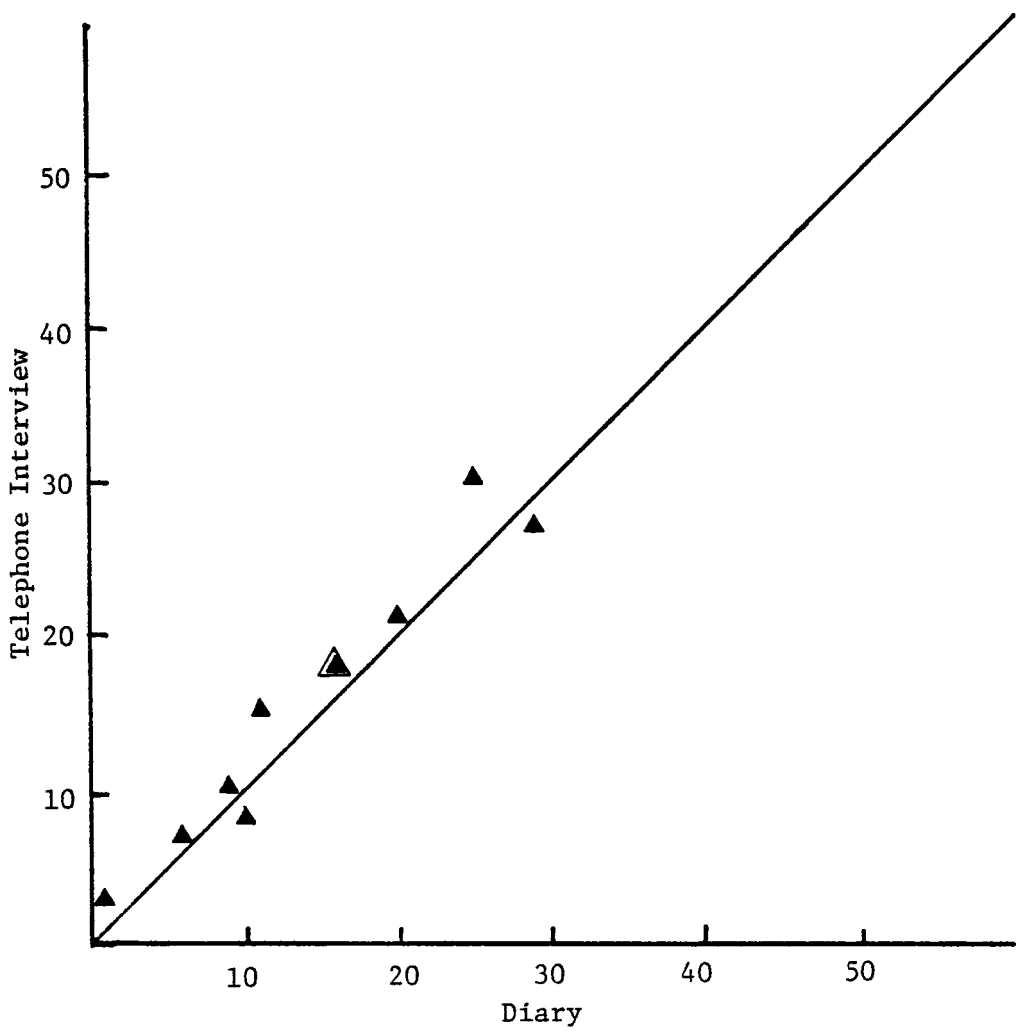

Figure 6

Number of Unassisted Activities
for Disabled Subjects

disabled subjects. It can be seen from the display that there is generally a slightly higher frequency generated by the telephone interview than the diary by the slight displacement upward from the line of perfect agreement. However, they were fairly small differences, and it was felt that perhaps the extremely high correlations sensitized the t-test for correlated measures to such a degree that a very small difference proved significant in terms of the test. With this in mind, the investigator decided to run analyses of variance with one axis being correlated data (different methods of reporting from the same subject) and the other axis being independent data (different subjects).

This decision brought up an issue in the data pool. One disabled subject had refused to do any diaries after the first one. Therefore, he was dropped. This left ten disabled and eleven nondisabled subjects. One nondisabled subject was missing two of his diaries. He reported that he had misplaced them at home; however, he never located them. Thus, the decision was made to drop his data from the data pool. This resulted in ten nondisabled and ten disabled subjects for the analyses of variance.

Analyses of Variance for Frequency Data

Analyses of variance were calculated on ten frequency measures--the eight listed in the correlation matrices presented as Tables 9 and 10 as well as two more, total number of assisted activities and number of different nonrelated (or attendant) companions. The design was two by two with one repeated axis (the diary and telephone interview on the same days for each subject) and one independent axis (the different subjects under the different data collection modes). Two main effects, disabled-nondisabled and diary-telephone interview, were tested as well as their interaction.

Table 13 shows the F-ratios and significance levels for the analyses involving diary and evening interview data for the frequency measures. The only significant main effect for mode was for total number of unassisted activities. The significance level was $p < .005$. There were three disability main effects that reached significance: total number of assisted activities (disabled subjects showing the higher frequencies), number of different assistants (disabled subjects again showing the higher frequencies), and total number of unassisted activities (disabled subjects showing the lower frequencies). In each case, the significance level was $p < .05$, and the frequencies were in the expected directions.

Figure 7 displays each subject's diary and interview data for number of unassisted activities (the one significant mode effect). Subjects Nos. 1 through 10 are disabled, and 11 through 20 are nondisabled. The dashed line for each subject represents the interview obtained frequencies; the solid line represents the diary obtained frequencies. The general direction was for the interview to generate the higher frequencies, but only slightly so. The means generated by the diary were 14.0 (for disabled subjects) and 23.8 (for nondisabled subjects). The means generated by the interview were 15.7 (for disabled subjects) and 25.2 (for nondisabled subjects). The differences are quite small, on the average under 2 units of difference for the two days of data collection. Three subjects (7, 9 and 14) showed higher than average differences. No. 7's differences were entirely due to a difference in the total number of activities reported by the two modes, all of which were unassisted. Subject No. 9, due to urinary problems, needed to empty her bladder quite often throughout the day. Her reporting of assistance for this activity on the diary but not on the interview accounted for most (four) of the discrepancies.

TABLE 13

Analysis of Variance F-Ratios for

Derived Frequency Measures in the D/Ie Comparison

		F-Ratio
Total Number of Activities		
	Disability	.492
	Mode	.057
	Interaction	.344
Number of Different Activities		
	Disability	1.074
	Mode	.709
	Interaction	3.434
Total Number of Assisted Activities		
	Disability	5.542*
	Mode	2.623
	Interaction	0.0
Number of Different Assistants		
	Disability	4.485*
	Mode	1.331
	Interaction	1.331
Total Number of Unassisted Activities		
	Disability	5.398*
	Mode	10.236***
	Interaction	.096
Total Number of Companions Listed		
	Disability	.499
	Mode	.005
	Interaction	.019
Number of Different Companions		
	Disability	1.696
	Mode	.040
	Interaction	0.0
Number of Different Unrelated (non-Attendant) Companions		
	Disability	.034
	Mode	0.0
	Interaction	0.0

TABLE 13

continued

		F-Ratio
Total Number of Nonhome Locations Listed	Disability	.116
	Mode	.007
	Interaction	2.687
Number of Different Nonhome Locations	Disability	.323
	Mode	0.0
	Interaction	.367

*sig. $p < .05$

**sig. $p < .01$

***sig. $p < .005$

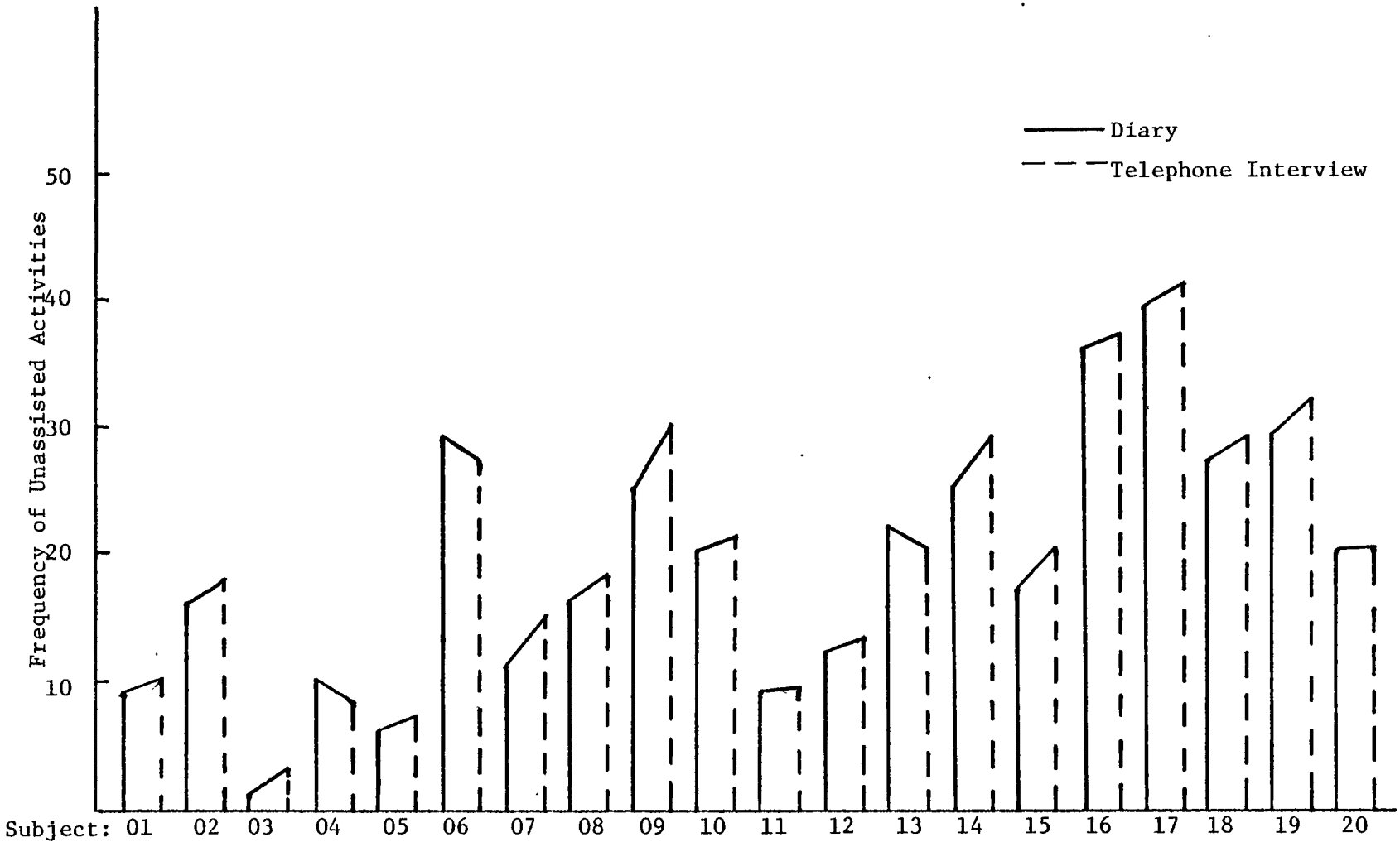

Figure 7
D/Ie Comparison of Number of Unassisted Activities
for Each Subject

Subject No. 14's differences in number of unassisted activities appeared to be random in nature, e.g., for preparing lunch, decorating a Christmas tree, participating in research at school, and riding in the car (this last a mistake in coding). These activities could have been assumed by the interviewer to be parallel in nature, with others simultaneously doing similar things, but not as actually helping the subject with his own part of the activity.

A scatterplot of these data shows more clearly the relationships between modes and disability status. Figure 8 presents this scatterplot with the diary frequencies along the horizontal axis and the interview frequencies along the vertical axis. It is clear from this graphing of the data that the nondisabled subjects reported higher frequencies of unassisted activities, an expected finding. It is also evident that the evening interviewing procedure generated slightly higher frequencies than did the self-report diary. The investigator feels that a different set of rules pertaining to recording assistance (see the discussion section for suggestions) would alleviate most of this discrepancy.

Figures 9 and 10 (this latter having narrower intervals for visual ease) display scatterplots of the data for the two main disability effects for the D/Ie data: total number of assisted activities, and number of different assistants. The graphic displays show clearly that most disabled subjects performed more assisted activities with a wider range of assistants than did nondisabled subjects. These findings are in agreement with professionals' notions about the behavioral effects of a disabling spinal cord injury: many routine daily behaviors such as bathing, shopping or transporting require a disabled person to obtain someone's assistance in order to complete them.

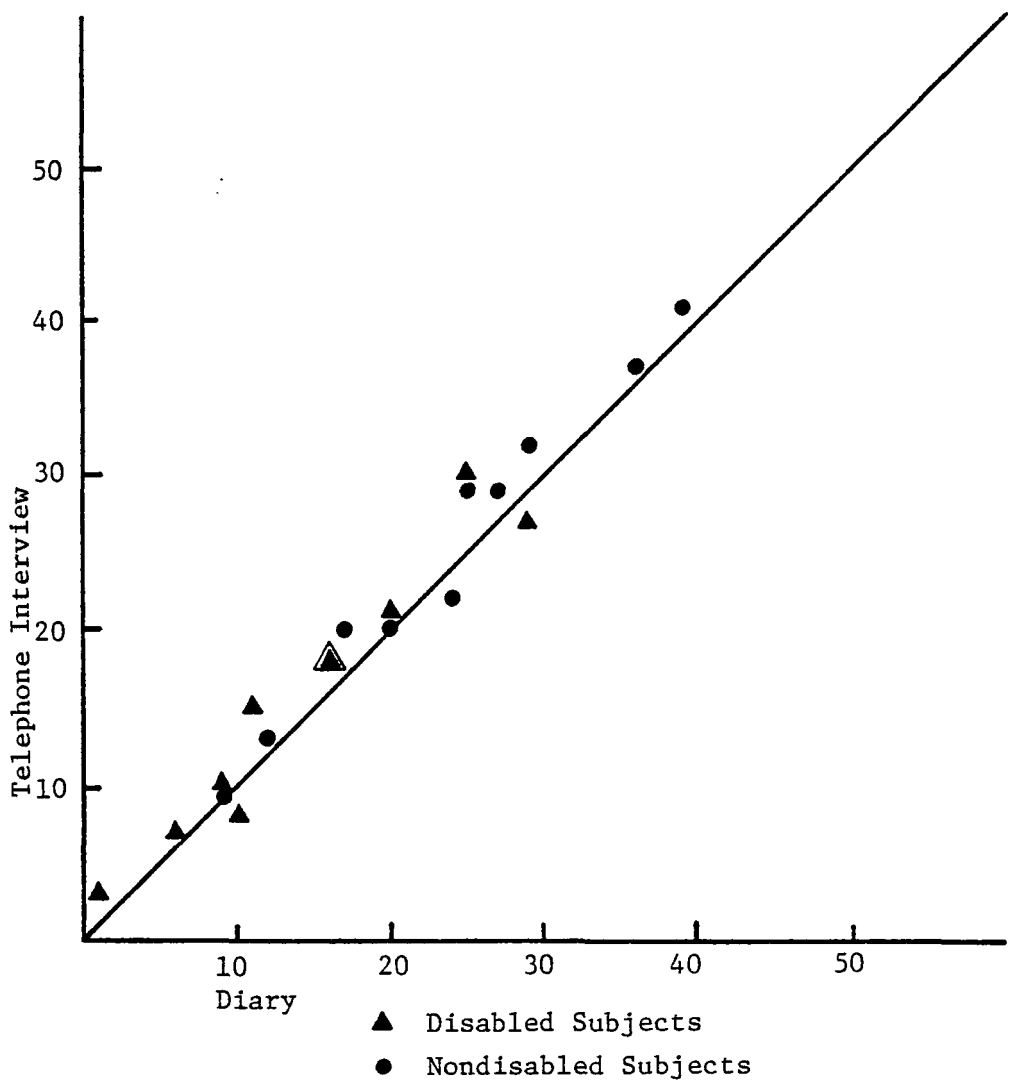

Figure 8
D/Ie Comparison of Number of
Unassisted Activities

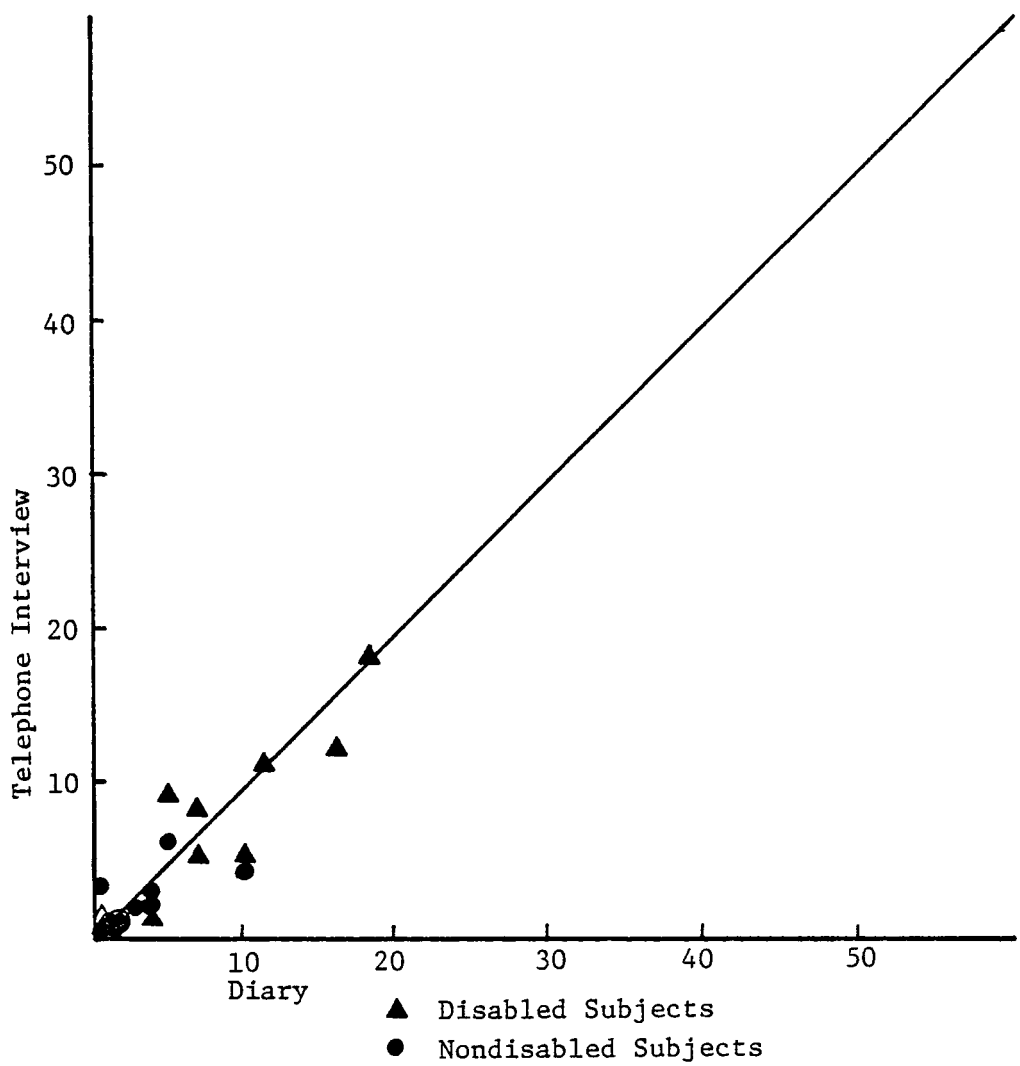

Figure 9
D/Ie Comparison of Number of
Assisted Activities

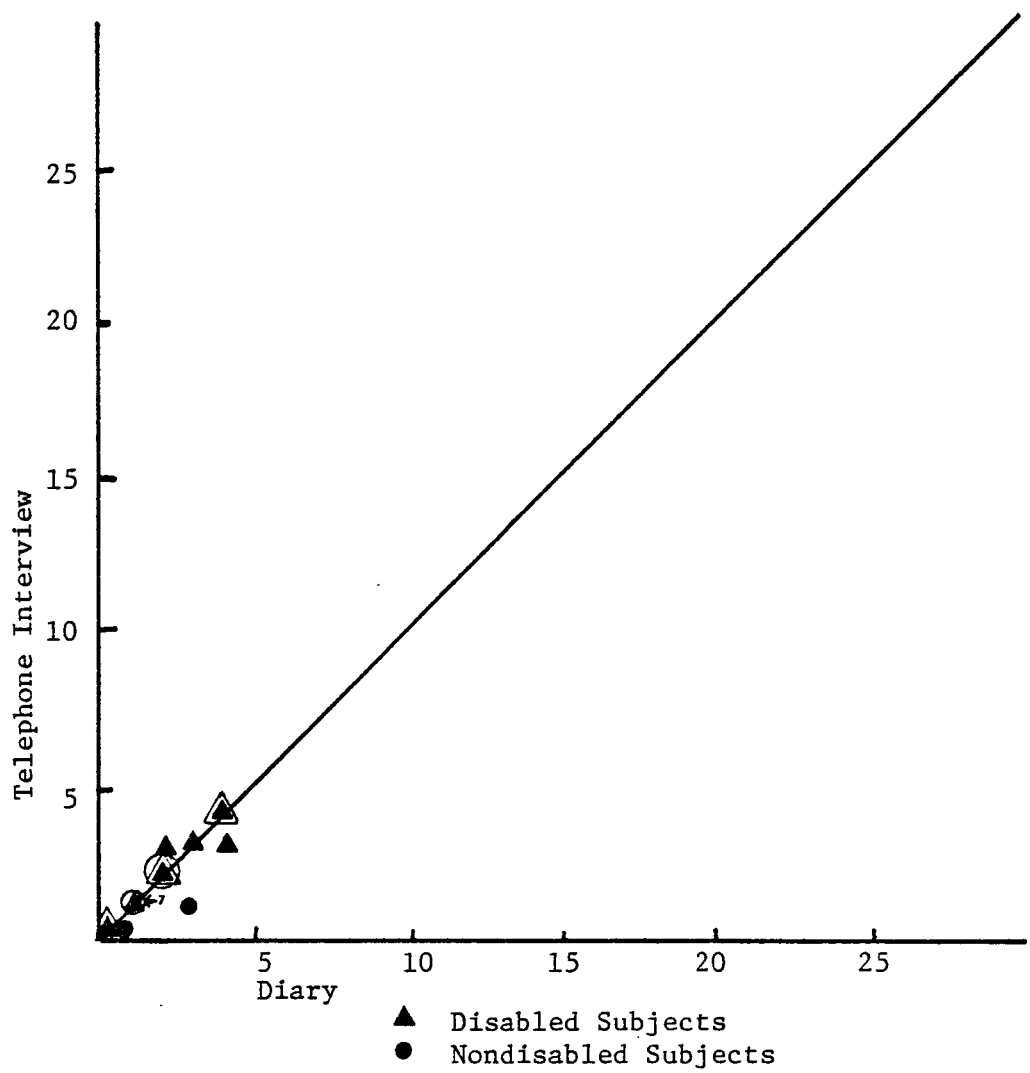

Figure 10
D/Ie Comparison of Number of
Different Assistants

Table 14 represents the results from analyses of variance on the D/Ime set of data. Two significant mode differences appeared, as well as two significant disability differences. The two measures in which mode differences appeared were total number of companions ($p < .05$) and total number of activities ($p < .01$). For total number of companions, Figure 11 displays the diary and interview frequencies for each subject. Although the interview means, in both cases, are higher than the diary means (31.3 versus 28.9 for disabled subjects; 40.0 versus 37.7 for nondisabled subjects), the difference is only 2.4 units for disabled persons and 2.3 units for nondisabled persons. In four cases for the disabled subjects and three for the nondisabled subjects, the diaries produced the same or higher frequencies. Raw data from the two disabled subjects whose mode differences were highest for their group (Nos. 8 and 9) were examined to ascertain the cause of the discrepancies. These two subjects were quadriplegics with a high degree of arm impairment, and with arm assistive devices for writing. One subject particularly (No. 9) showed an especially large difference in her use of the two reporting modes for this measure. The research assistant who interviewed her reported that her accounts over the telephone were straightforward and pleasant in nature. She had mentioned to him during her interviews that she had some difficulty with writing out the diaries, since she was a quadriplegic with little hand control without an assistive device which had to be gotten out and put on whenever she wrote. An examination of her protocols showed the difference in companion notations to be large during wheelchair and auto transportation activities when the subject did not fill out or only partially filled out the companion section, not listing, for instance, driver, other riders, attendant, or

TABLE 14

Analysis of Variance F-Ratios for

Derived Frequency Measures in the D/Ime Comparison

		F-Ratio
Total Number of Activities		
	Disability	2.001
	Mode	9.332**
	Interaction	.041
Number of Different Activities		
	Disability	1.540
	Mode	2.689
	Interaction	1.089
Total Number of Assisted Activities		
	Disability	3.752
	Mode	.022
	Interaction	.022
Number of Different Assistants		
	Disability	2.713
	Mode	0.0
	Interaction	.231
Total Number of Unassisted Activities		
	Disability	13.775***
	Mode	1.833
	Interaction	.204
Total Number of Companions Listed		
	Disability	1.737
	Mode	4.820*
	Interaction	.002
Number of Different Companions		
	Disability	2.637
	Mode	.086
	Interaction	.771
Number of Different Unrelated (non-Attendant) Companions		
	Disability	4.182
	Mode	.184
	Interaction	.184

TABLE 14

continued

		F-Ratio
Total Number of Nonhome Locations Listed		
	Disability	1.375
	Mode	2.875
	Interaction	.010
Number of Different Nonhome Locations		
	Disability	11.592***
	Mode	.375
	Interaction	.375

*sig. $p < .05$

**sig. $p < .01$

***sig. $p < .005$

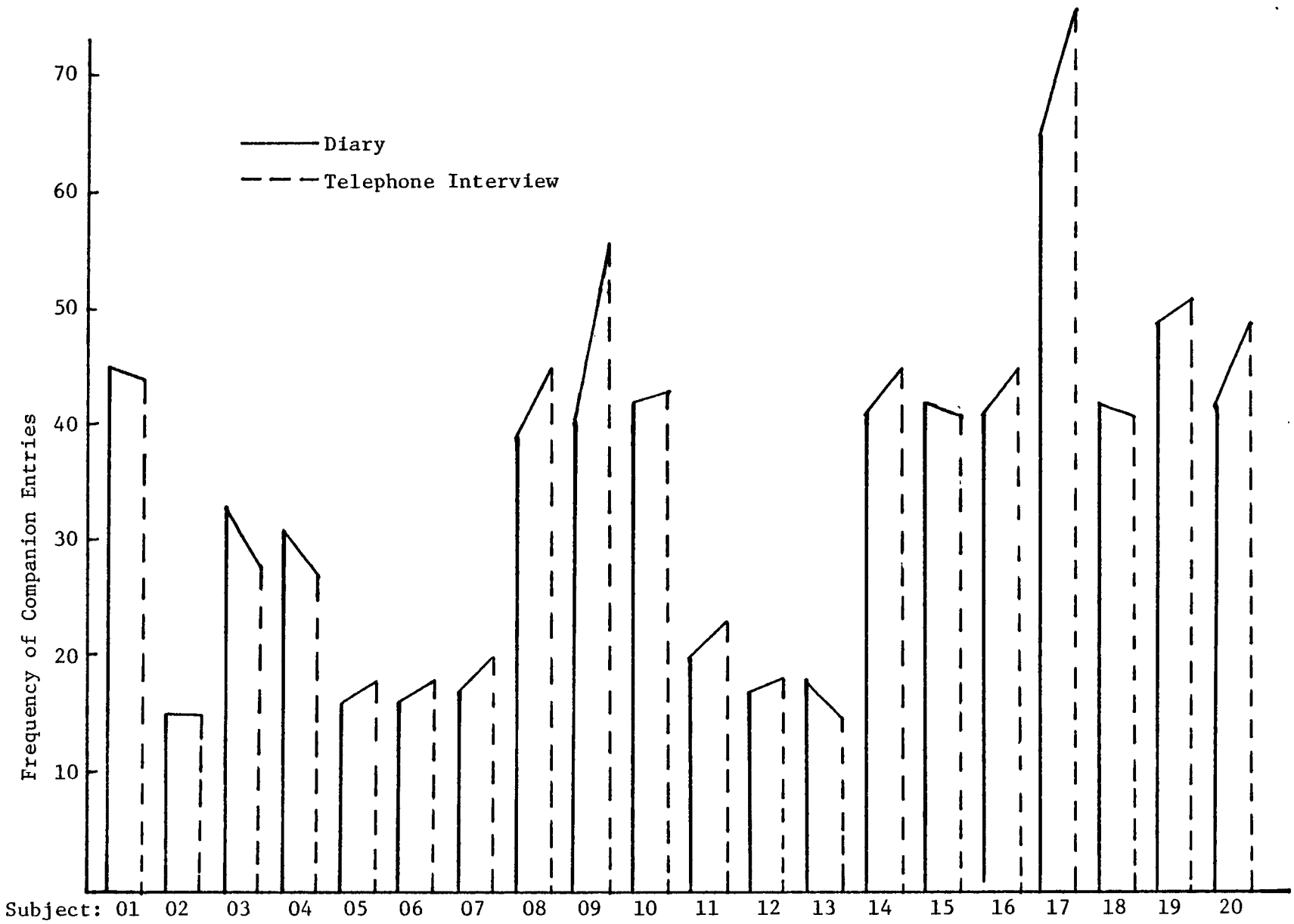

Figure 11
D/Ie Comparison of Number of
Companions Listed for Each Subject

friend. Writing out the many companions' names on diaries may, for some of the quadriplegics, have been an especially onerous chore, which was done with varying amounts of commitment by those subjects.

The two nondisabled subjects showing the greatest differences between reporting modes were Nos. 17 and 20. One subject had misunderstood the "within hearing" definition of companions and did not list persons when they were not in the room with her but elsewhere in the house. The other nondisabled subject did not always list her nieces or tangential relatives when at family get-togethers.

Figure 12 shows a scatterplot of the number of companions in the D/Ime condition. It is evident that the nondisabled frequencies were generally higher than the disabled frequencies. It also appears that as the reported frequencies rise above 45 units, so do the discrepancies between modes. This finding agrees with the notion of difficulty, fatigue, or lack of commitment in completing all the writing requirements for the self-recorded diary under conditions of high activity.

Problems of recall may also play a part in this finding. If diaries were only filled out periodically during the day at natural activity change points such as lunch (as is indicated by feedback from the subjects), then companions, especially if they were only tangentially involved in the activity, might be forgotten between writing times. There would also be more writing to do at each recording session in high activity conditions, resulting in more work and commitment from the subject in order to recall accurately and note the more numerous events between diary recording points. As one subject put it, "carting this pad around all day is a pain." He was referring not only to having to pack it around with him throughout the day, but also to the responsibility (his) for data collection that it represented.

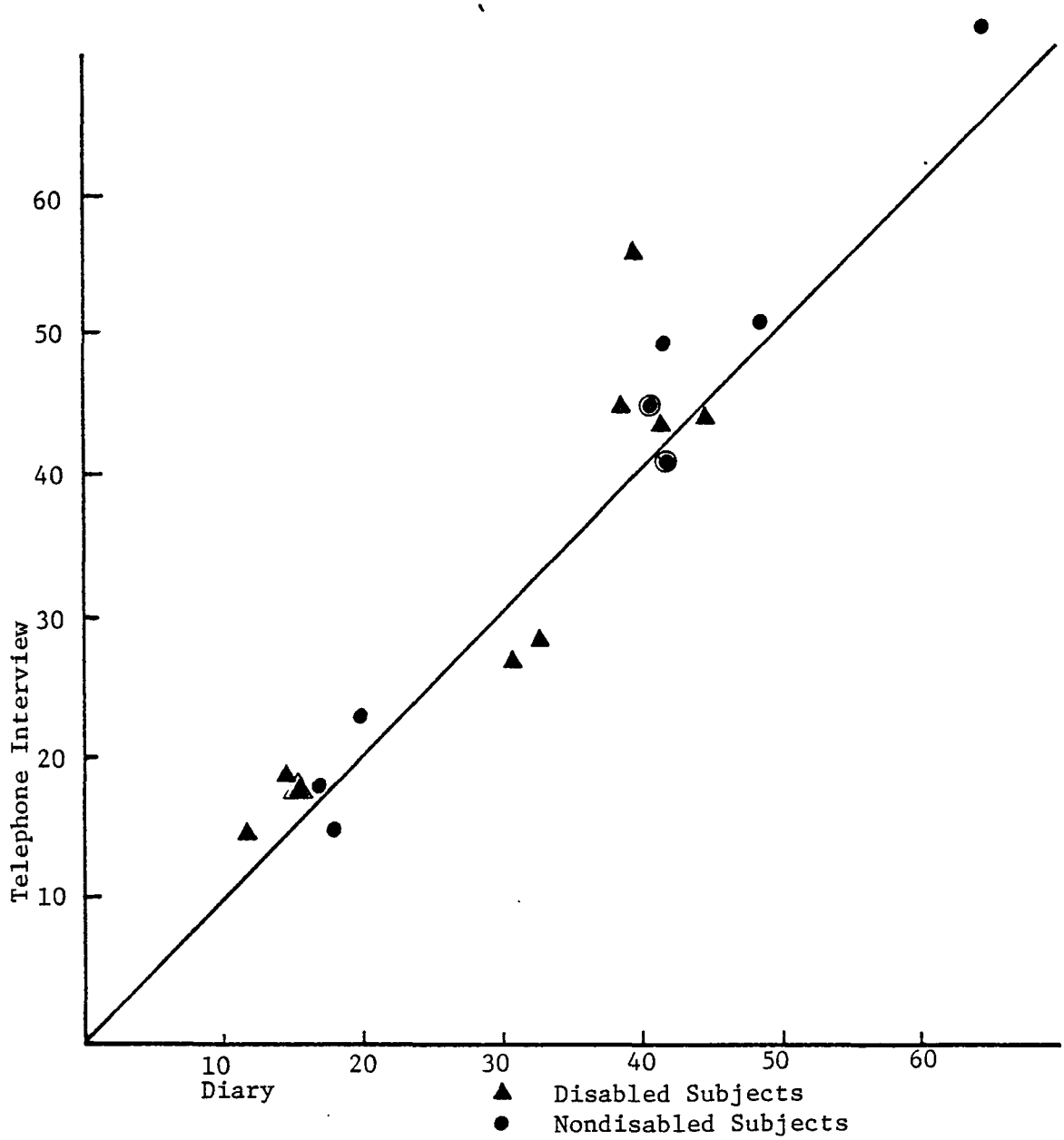

Figure 12
D/Ime Comparison of Number of
Companions Listed

Total number of activities was the other measure for which there was a mode difference ($p < .01$). Figure 13 displays the actual frequencies for each subject. For the disabled group, the means were 32.4 (interview) and 30.8 (diary), a difference of 1.6 units. For the nondisabled group, the means were 38.4 (interview) and 37.0 (diary), a difference of 1.4 units. These are small but consistent differences, with the larger frequency generated by the telephone interview in most cases. The two high discrepancy cases in the disabled group were Subjects Nos. 9 and 10. Subject No. 9 reported "messing around the apartment" between two other specified activities during an interview, but did not list anything other than the two specific activities for the same period on the self-report diary. The other subject (No. 10) separated "eating" from "chatting" after lunch in the telephone interview, but not in his diary, and also omitted 5-10 minutes of "wait in car for wife and child" from the diary record which was reported over the telephone in his interview.

For the nondisabled subjects, Nos. 11, 14 and 20 showed the highest mode differences. Subject No. 11's protocols showed that differences stemmed from telephone calls, from 5 to 15 minutes, which interrupted long ongoing activities. These short interruptions were gathered by the telephone interview, but not noted on the self-report diary. Each interruption in an ongoing activity resulted in two (not just one) more activity units. Figure 14 shows the schematic representation of an example of this particular problem.

The separation of the midday+evening telephone interviews into two distinct protocols produced an artifact on several occasions. When the midday interview was less than 5 minutes long (and therefore not recorded

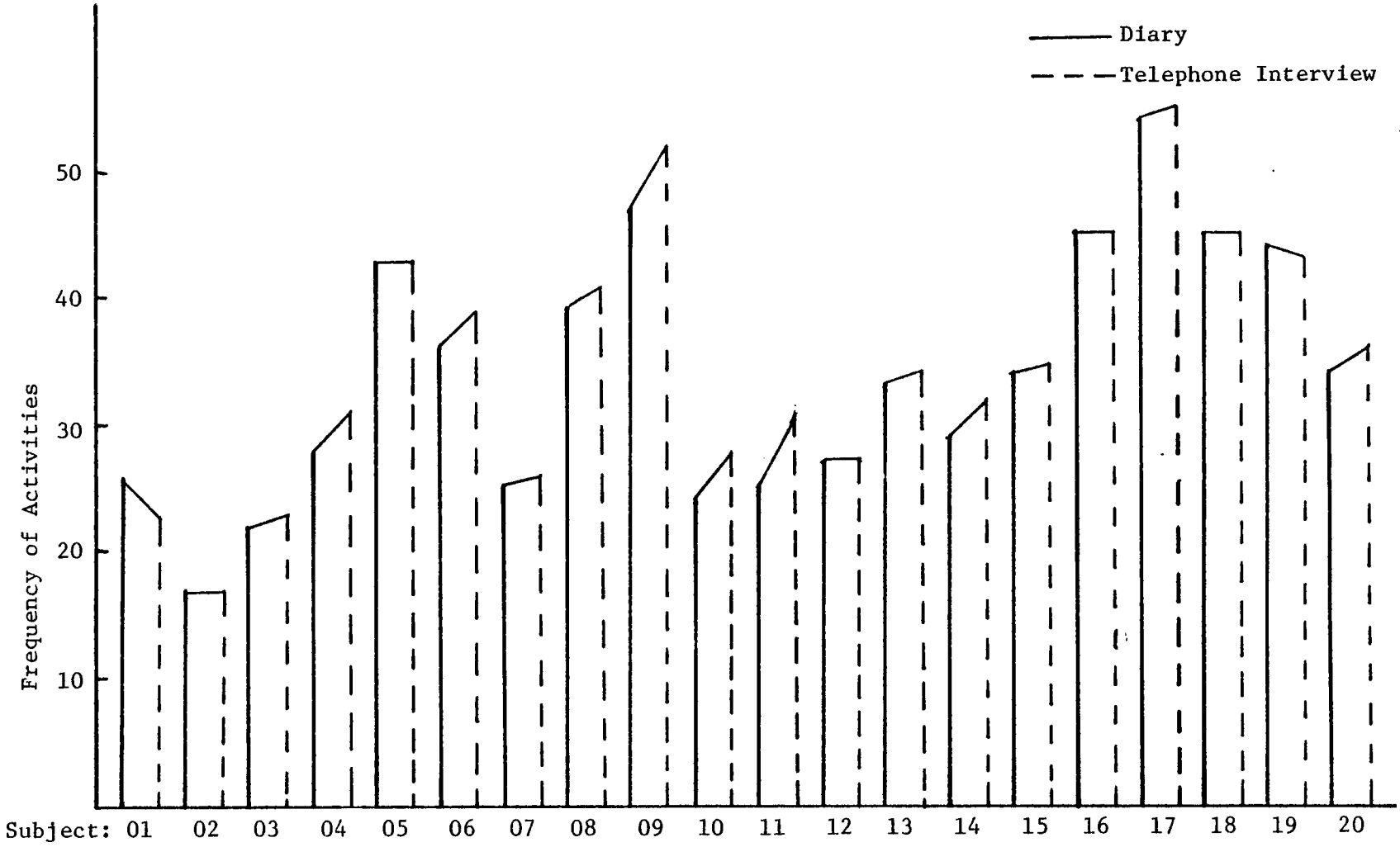

Figure 13
D/Ime Comparison of Number of
Activities for Each Subject

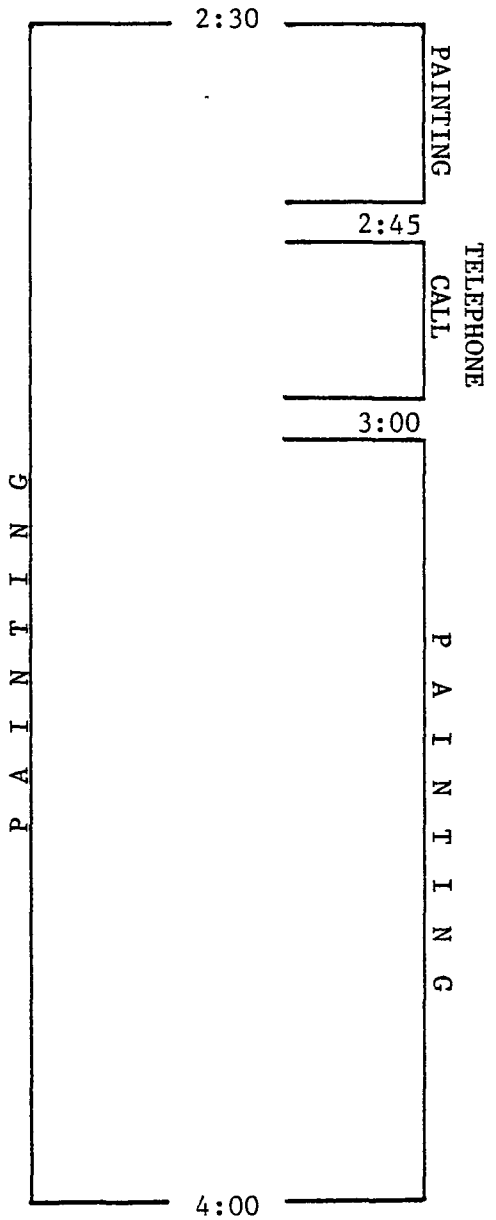

Figure 14
Interruption of an Ongoing Activity

by the subject on his diary), and the subject's activity before the interview continued after the interview, the interviewer recorded it twice: as the last one of the midday data, and the first one of the evening data. This extra activity unit recorded affected Subject No. 14's data on both D/Ime data days.

Subject No. 20's data showed differences across modes in combining and separating activities. The diary had some activities combined under one unit, for example, "dressed and ate." The interviewer, by contrast, asked for separate times for each activity, and listed them as two separate activities with accompanying information. The investigator looked over samples of protocols from each subject, and found that this occurred in many of them. It is felt that much more information about activity range is given by being able to code the various behaviors and their frequencies, rather than just designating a "multiple activity" code (Table 6) which gives no information on types of behaviors, only number of behaviors.

Figure 15 displays a scatterplot of the total number of activities for disabled and nondisabled persons as gathered by self-report diary (horizontal axis) and midday + evening telephone interview (vertical axis). This graph makes clear the small but consistent difference between modes, showing most points to be slightly higher on the vertical axis.

Two measures showed disability differences in the D/Ime condition. Total number of unassisted activities was significantly lower for disabled persons than for nondisabled persons ($p < .005$). However, total number of assisted activities and total number of activities did not show a similar effect, so it was reasoned that the disabled subjects (who showed the lower frequencies) generated higher frequencies of behaviorally idle activities

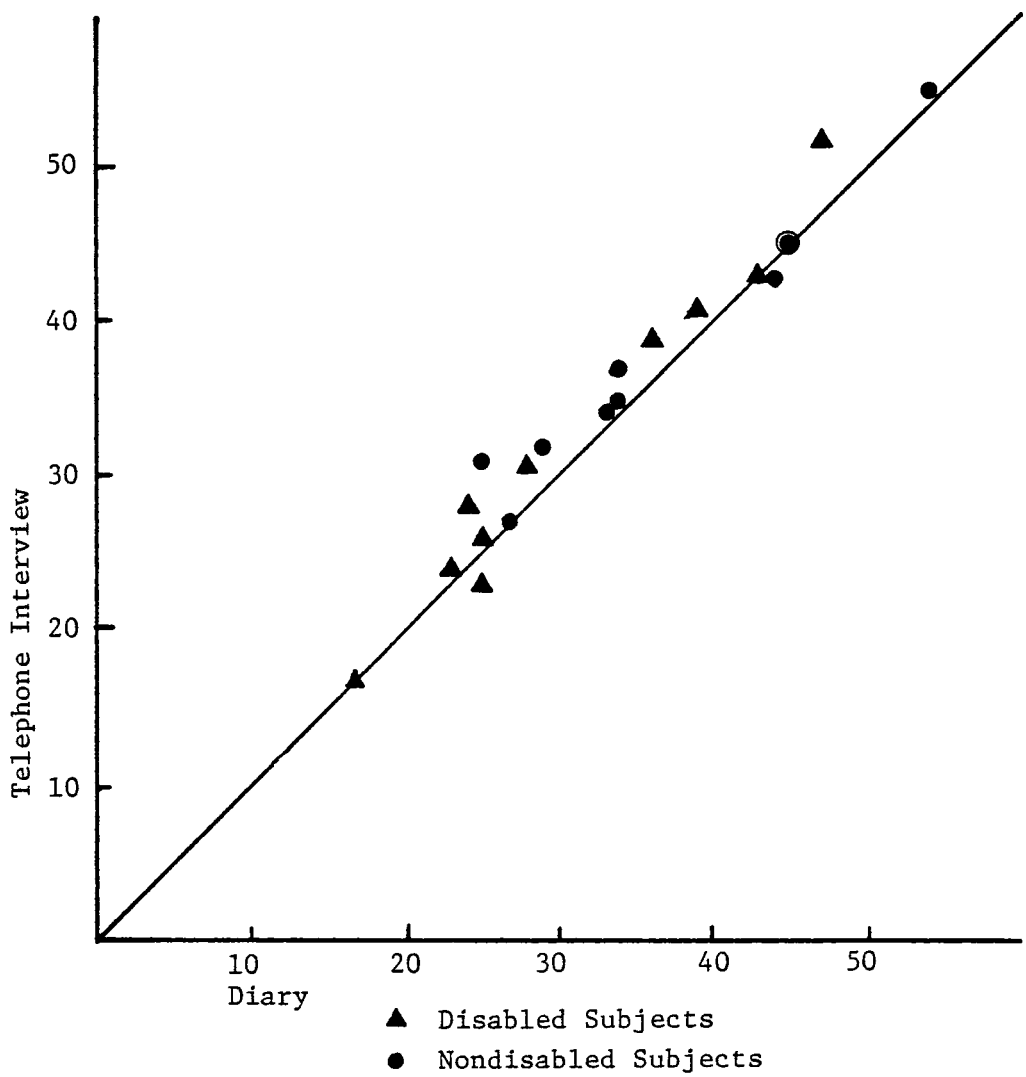

Figure 15
D/Ime Comparison of Number of Activities

such as sitting, lying down, or chatting which, being behaviorally idle, were assigned a code designating behavioral assistance as irrelevant in this activity, thus not resulting in a disability difference for the measure, total number of activities. Figure 16 displays the scatterplot of these data.

The second measure with a main effect for disability was number of different nonhome locations entered ($p < .005$). Once again the disabled subjects had the lower frequencies. Figure 17 shows the scatterplot of the data. Since the total number of nonhome location entries did not differ with respect to disability status, it was reasoned that although disabled persons made as many nonhome location entries, the diversity was less for them than it was for the nondisabled persons. In summary, the D/Ime data generated several differences, both in terms of mode as well as measure. It was concluded that for frequency measures, the differences between the self-report diary and the telephone interview, especially the evening-only interview, were extremely small. Disability differences were, in no cases, discordant with known or expected differences.

Measurement of Overlap for Frequency Data

Tilton (1937) developed a technique for testing overlap between two distributions. The technique was chosen here as an additional test of association between the diary and telephone interview modes of data collection. Tilton criticized previous measures of overlap as not fully representing the overlapping characteristics of the data. His alternative utilizes the difference between means in standard deviation units as the

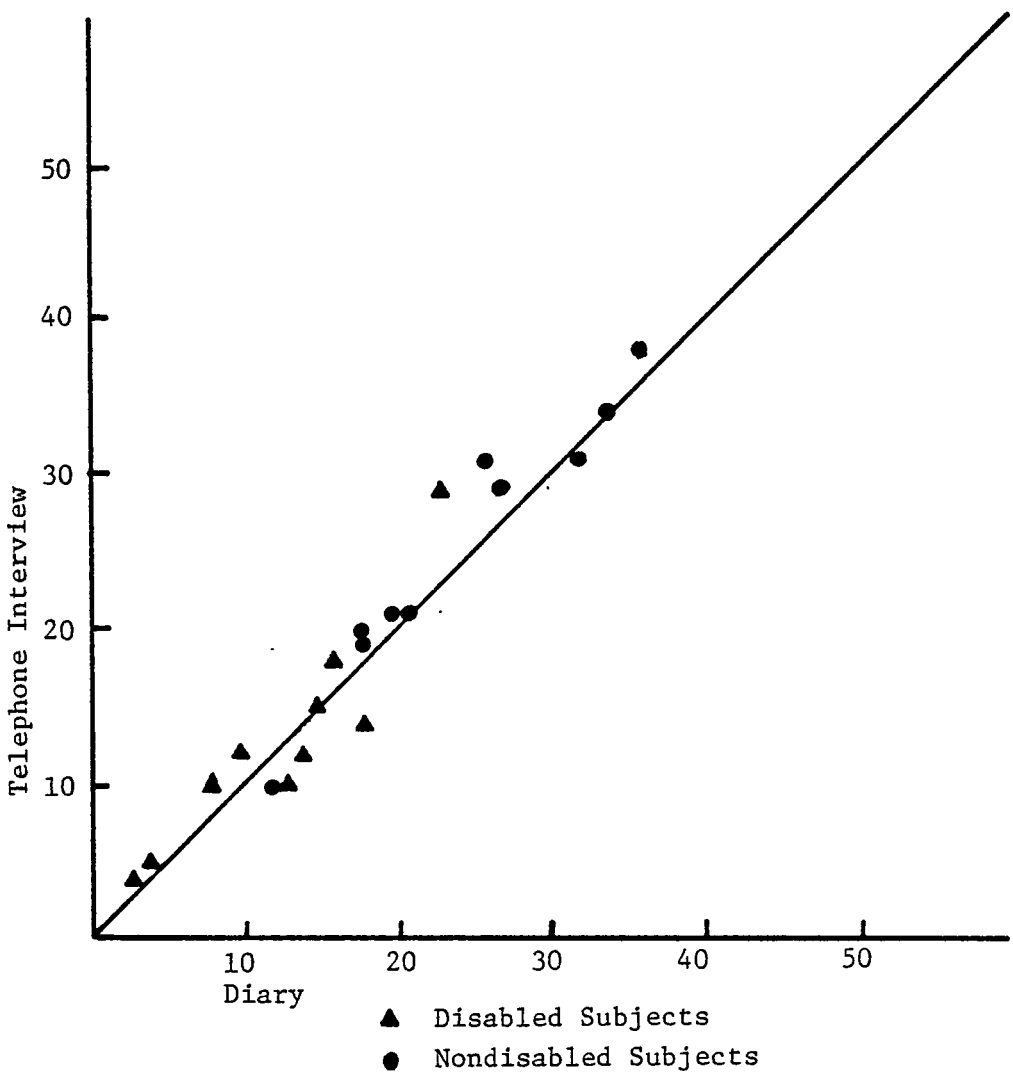

Figure 16
D/Ime Comparison of Number of
Unassisted Activities

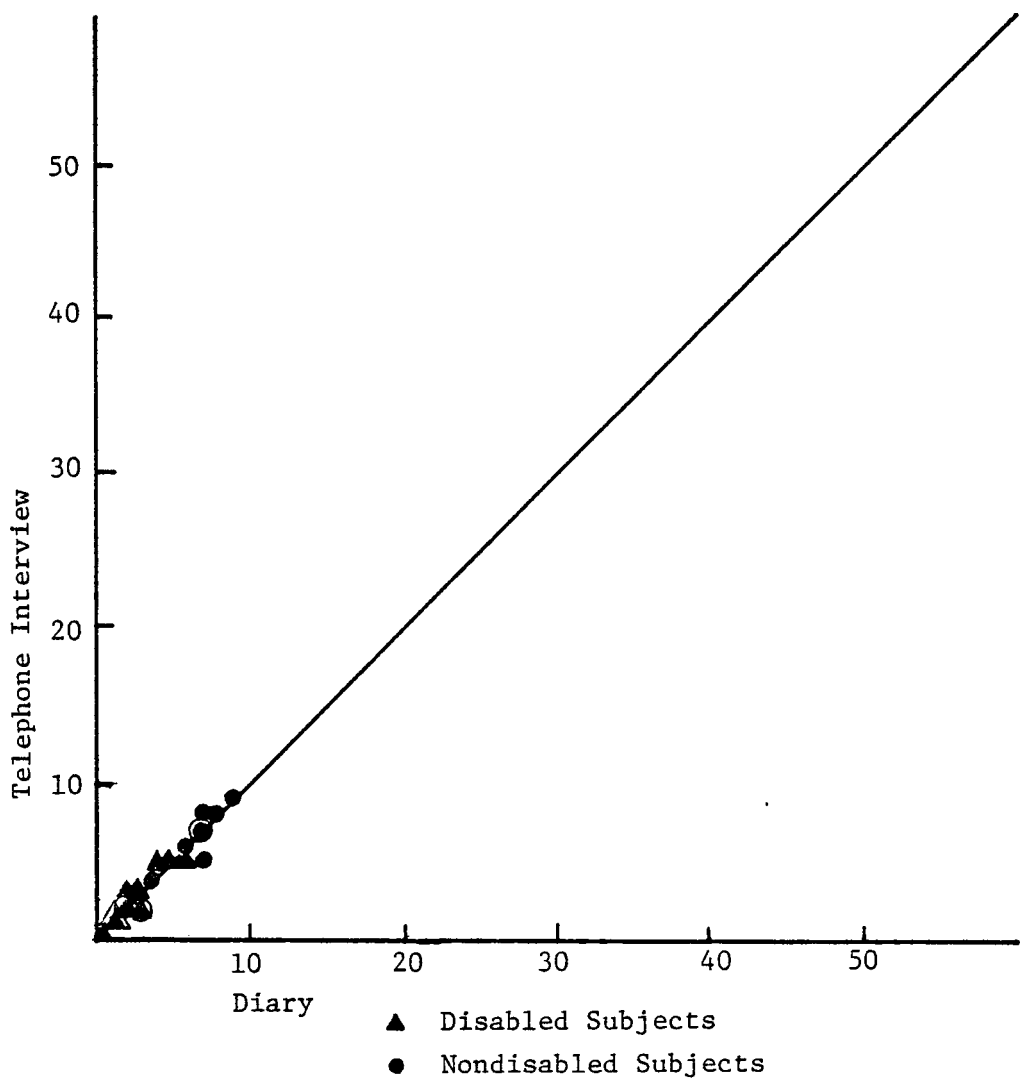

Figure 17
D/Ime Comparison of Number of
Different Nonhome L oca tions

measure of overlap between two distributions of data. To compute this analysis, the difference in the means of two groups of data is divided by the average of their standard deviations. The result is checked in a table devised by Tilton to ascertain the appropriate percent of overlap. Using Tilton's measure of overlap allows the investigator to test the null hypothesis of difference rather than to test the null hypothesis of no difference.

Table 15 gives the percent overlap figures for all of the frequency measures under the diary/evening interview comparison. The overlap between the data generated by the two modes was never less than 92% for any of the measures, and for the number of different nonrelated companions and the number of different nonhome location entries, there was 100% overlap. Looking back at Table 13, it can be seen that the F-ratios for mode in these two cases were 0.0. The two highest F-ratios are also the two cases of lowest overlap--the total number of assisted activities and the total number of unassisted activities, each analysis further substantiating the other.

For the D/Ime comparison, Table 16 displays the overlap statistics. The number of different assistants, with an F-ratio of 0.0 (Table 14), showed 100% overlap. The only overlap below 90% was for the total number of companion entries at 89.85%. This measure also generated a significant F-ratio in the analysis of variance test. The overlap statistics in the D/Ime comparisons were lower in 6 out of 10 cases than the D/Ie comparisons, although overlap above 80% denotes no difference between two distributions (Danford, 1974; Dunnette, 1969).

TABLE 15

Tilton's Measure of Overlap for

Derived Frequency Measures in the D/Ie Comparison

	% Overlap
Total Number of Activities	98.32
Number of Different Activities	93.96
Total Number of Assisted Activities	92.92
Number of Different Assistants	95.16
Total Number of Unassisted Activities	93.92
Total Number of Companions Listed	99.80
Number of Different Companions	97.44
Number of Different Unrelated (non-Attendant) Companions	100.00
Total Number of Nonhome Locations Listed	99.80
Number of Different Nonhome Locations	100.00

TABLE 16

Tilton's Measure of Overlap for

Derived Frequency Measures in the D/Ime Comparison

	% Overlap
Total Number of Activities	92.40
Number of Different Activities	90.68
Total Number of Assisted Activities	99.56
Number of Different Assistants	100.00
Total Number of Unassisted Activities	99.08
Total Number of Companions Listed	89.85
Number of Different Companions	98.72
Number of Different Unrelated (non-Attendant) Companions	98.68
Total Number of Nonhome Locations Listed	96.52
Number of Different Nonhome Locations	98.48

Measurement of Overlap and Correlations for Duration Data

The overlap statistic was also applied to duration measures, the elapsed time (number of minutes) for a measure over the data days of a particular mode. Although frequency measures are, by far, the more commonly used measures in behavioral studies, it was felt that some analysis of these duration measures might prove useful as a further test of agreement between modes.

Correlations were calculated between the two modes for categories of activities, persons and locations. Tilton's overlap statistic was calculated for the elapsed time for each of the categories. It was felt that this sort of analysis, category by category, would supplement the analyses of the derived frequency measures, and perhaps point to any particular categories with low correlations or overlap percentages. These could then be examined individually across subjects.

Table 17 displays the product moment correlations for all of the categories of activities (n=20 subjects), both for the diary/midday+evening interview and for the diary/evening interview comparisons. An asterisk denotes those categories for which behavioral occurrences were obtained for fewer than 50% of the subjects, and were, therefore, dropped from the analyses as being too infrequent to generate valid correlation coefficients. (Table 6 contains full descriptions of the activities which appear in abbreviated form in the table.)

The lowest correlations in the table were for "fleeting communication" (No. 17 in the table), which was especially low in the D/Ime condition (.64). This recalls a discussion in the analysis of variance section where

TABLE 17

Correlations of Duration Data for

Activity Codes in Two Diary-Interview Comparisons

	r=	
Activity Labels	Diary Midday+Evening Interview	Diary Evening Interview
1. Auto Transport	.94	.99
2. Wheelchair Transport	.94	.80
3. Ambulatory Transport	*	*
4. Leisure Recreation	.78	.84
5. Physical Recreation	.86	.75
6. Obtaining Goods	*	.92
7. Idle	.95	.75
8. Employment	*	.97
9. School	*	.89
10. Writing/Typing	*	*
11. Meals	.98	.83
12. Pets	*	*
13. Sex	*	*
14. Religion	*	*
15. Transfer	*	*
16. Home (etc.) Upkeep	.96	.92
17. Fleeting Communication	.64	.73
18. Visiting	.81	.80
19. Partying	*	*
20. Grooming (Self)	.93	.97
21. Grooming (Others)	*	*
22. Medical/Professional	*	*
23. Unspecified	*	*
24. Interview/Diary	.83	*
25. Multiple	.78	.94

*--occurrence for fewer than 50% of the subjects

it was seen that short 5 to 15 minute telephone calls were not recorded by the subjects in diaries, but were communicated to the interviewers over the telephone. The .78 correlation coefficient for "multiple activities" (designating two or more activities not separated but listed together with one beginning and ending time) reflects a slight decrease in agreement noted in the discussion of the D/Ime mode difference for the total number of activities frequency measure. The two categories of recreation (Nos. 4 and 5 in the table) also showed slightly lower correlations for duration, the range being r=.75 to .86, although the two lowest scores were reversed between modes. The "idle" category (No. 7 in the table) also showed one of the lower correlations, r=.75, under the diary/evening interview condition. Testing whether the correlation coefficients represent real as opposed to chance relationships, all correlation coefficients were significant at $p < .001$, with the exception of "fleeting communication" in the D/Ime condition which was significant at $p < .01$, firmly rejecting the null hypothesis of r=0.

Tables 18 and 19 present Tilton's overlap statistics for each of the activity categories under the two comparison conditions. Again, the statistics were not calculated for those categories of behaviors not reported by 50% or more of the subjects. The only figure under 90% overlap was 88.20 for the "idle" (No. 7 in the table) category under the D/Ie condition. This same category showed one of the lower correlations, r=.75, as noted in the previous paragraph. Examining the data for each subject does not help in locating a particular problem or trend for this category. The rest of the activity categories showed overlap to be in the range of 93.48% to 99.48%. The duration tests reinforced the finding

TABLE 18

Tilton's Measure of Overlap for

Activity Duration Data in the D/Ie Comparison

Activity Labels	% Overlap
1. Auto Transport	98.88
2. Wheelchair Transport	94.04
3. Ambulatory Transport	(90% 0-non0 Agreement)*
4. Leisure Recreation	96.80
5. Physical Recreation	98.20
6. Obtaining Goods	97.68
7. Idle	88.20
8. Employment	96.64
9. School	96.52
10. Writing/Typing	(100% 0-non0 Agreement)*
11. Meals	98.60
12. Pets	(100% 0-non0 Agreement)*
13. Sex	(90% 0-non0 Agreement)*
14. Religion	(100% 0-non0 Agreement)*
15. Transfer	(90% 0-non0 Agreement)*
16. Home (etc.) Upkeep	95.20
17. Fleeting Communication	96.20
18. Visiting	99.00
19. Partying	(95% 0-non0 Agreement)*
20. Grooming (Self)	98.16
21. Grooming (Others)	(100% 0-non0 Agreement)*
22. Medical/Professional	(100% 0-non0 Agreement)*
23. Unspecified	(95% 0-non0 Agreement)*
24. Interview/Diary	(95% 0-non0 Agreement)*
25. Multiple	94.69

*--occurrence for fewer than 50% of the subjects

TABLE 19

Tilton's Measure of Overlap for

Activity Duration Data in the D/Ime Comparison

Activity Labels	% Overlap
1. Auto Transport	97.88
2. Wheelchair Transport	93.48
3. Ambulatory Transport	(90% 0-non0 Agreement)*
4. Leisure Recreation	99.48
5. Physical Recreation	95.88
6. Obtaining Goods	(100% 0-non0 Agreement)*
7. Idle	97.92
8. Employment	(100% 0-non0 Agreement)*
9. School	(95% 0-non0 Agreement)*
10. Writing/Typing	(95% 0-non0 Agreement)*
11. Meals	97.44
12. Pets	(90% 0-non0 Agreement)*
13. Sex	(95% 0-non0 Agreement)*
14. Religion	(95% 0-non0 Agreement)*
15. Transfer	(95% 0-non0 Agreement)*
16. Home (etc.) Upkeep	95.88
17. Fleeting Communication	98.68
18. Visiting	97.20
19. Partying	(95% 0-non0 Agreement)*
20. Grooming (Self)	99.40
21. Grooming (Others)	(95% 0-non0 Agreement)*
22. Medical/Professional	(100% 0-non0 Agreement)*
23. Unspecified	(85% 0-non0 Agreement)*
24. Interview/Diary	96.92
25. Multiple	98.44

*--occurrence for fewer than 50% of the subjects

of lower agreements between modes for "fleeting conversation" and "multiple activity" units, but did not, in any systematic way, point to other activity category problems. In fact, since they were all above the 80% criterion (Danford, 1974; Dunnette, 1969), there were no differences between modes in use of the activity codes.

Table 20 displays the product moment correlations for duration data on companions (elapsed time over all occasions when a category of person, for instance, spouse, was a companion) and assistants (elapsed time of activities during which a person was an assistant) under both mode comparison conditions. Since many categories of persons were involved in fewer than 50% of the subjects' data, only the 50% or greater occurrence categories are in the table. The correlation coefficients for assistants ranged from .92 to .99 with the exception of the diary/evening interview comparison for "spouse," which was .88. However, the number of subjects involved in this correlation calculation was only seven, which could have affected the results. Activities done with no assistants showed high correlation coefficients, .92 and .99 for the D/Ime and D/Ie conditions, respectively.

Correlations for companion codes ranged from .86 to .99, with the exception of the "co-workers and classmates" category under the diary/midday+evening interview condition, which had a coefficient of .69. The companion correlations were generally lower than the assistant correlations. Examination of the actual times for the "co-workers and classmates" category revealed that the interview generated the higher duration times. Referring back to the discussion in the analysis of variance section, it is noted that companion reporting under the D/Ime condition also showed

TABLE 20

Correlations of Duration Data for

Person Codes in Two Diary-Interview Comparisons

	r=	
	Diary Midday+Evening Interview	Diary Evening Interview
Assistant Codes		
1(Spouse)	.98	.88(n=7)
17(Behaviorally Idle/Irrelevant)	.98	.95
0(Independent/No Assistants)	.92	.99
Companion Codes		
1(Spouse)	.99	.99
8(Co-workers/Classmates)	.69	.94
13(Acquaintances)	.95	.86
0(No Companions)	.88	.96

Note: The remaining Person Codes occurred for fewer than 50% of the subjects.

mode discrepancies with the interview generating the higher number. Since the various person codes were listed more often under the interview condition, it is logical that the accumulated times for the codes or categories would also be greater under the interview condition. The significant levels in all cases were at $p < .001$.

Tables 21 and 22 show the overlap statistics for the person category duration measures. The only overlap under 92.24% was for spouse as assistant under the D/Ie condition at 89.19%. This category under the D/Ie condition also produced the lowest correlation, .88. Again, the number of paired comparisons was only seven, and this could have had some effect on the statistics. The overlaps all were well above the .80 criterion, denoting no differences between the modes on use of the person categories.

Table 23 shows the product moment correlations for duration of the various location codes which were collapsed into seven groups for ease of analysis: residence, public areas, others' residences, work, school, service location, recreation locations. The correlation coefficients were quite high, ranging from .87 (the subject's own residence under the D/Ie condition) to .996 (service locations under the D/Ime condition), achieving significance levels of $p < .001$ in all cases.

As can be seen in Table 24 (measurement of overlap), the two lowest correlations, .87 for one's own residence and .93 for public areas, correspond with the two lowest Tilton overlap statistics, 98.60% (one's own residence under the D/Ie condition) and 97.28% (public roadways under the D/Ime condition). However, all measures were well above the 80% criterion, showing no difference between the distributions. In summary, the duration

TABLE 21

Tilton's Measure of Overlap for

Assistant Duration Data in Two Diary-Interview Comparisons

Diary/Evening Interview Comparison	% Overlap
1(Spouse)	89.19(n=7)
17(Behaviorally Idle/Irrelevant)	99.20
0(Independent/No Assistants)	94.54

Diary/Midday+Evening Interview Comparison	% Overlap
1(Spouse)	99.60
17(Behaviorally Idle/Irrelevant)	99.40
0(Independent/No Assistants)	98.85

Note: The remaining Assistant Codes occurred for fewer than 50% of the subjects. The 0-non0 Agreement rates ranged from 90% to 100%.

TABLE 22

Tilton's Measure of Overlap for

Companion Duration Data in Two Diary-Interview Comparisons

Diary/Evening Interview Comparison	% Overlap
1(Spouse)	99.12
8(Co-worker, Classmate)	99.08
13(Acquaintance)	99.72
0(Acted Alone/No Companions)	100.00

Diary/Midday+Evening Interview Comparison	% Overlap
1(Spouse)	97.92
8(Co-worker, Classmate)	92.24
13(Acquaintance)	97.80
0(Acted Alone/No Companions)	96.12

Note: The remaining Companion Codes occurred for fewer than 50% of the subjects. The 0-non0 Agreement rates ranged from 85% to 100%.

TABLE 23

Correlations of Duration Data for

Location Codes in Two Diary-Interview Comparisons

	r=	
	Diary	Diary
Location Codes(collapsed)	Midday+Evening Interview	Evening Interview
1(Own Residence)	.99	.87
2(Public Roadways)	.93	.95
3(Others' Residences)	.99	*
4(Work)	.96	.99
5(School)	*	*
6(Service Locations)	.996	.96
7(Recreation Locations)	*	*

*--occurrence for fewer than 50% of the subjects

TABLE 24

Tilton's Measure of Overlap for

Location Duration Data in Two Diary-Interview Comparisons

Diary/Evening Interview Comparison	% Overlap
1(Own Residence)	98.60
2(Public Roadways)	100.00
4(Work)	99.32
6(Service Locations)	95.36

Diary/Midday+Evening Interview Comparison	% Overlap
1(Own Residence)	99.48
2(Public Roadways)	97.28
3(Others' Residences)	99.76
4(Work)	98.52
6(Service Locations)	98.52

Note: The remaining Location Codes occurred for fewer than 50% of the subjects. The 0-non0 Agreement rates ranged from 90% to 100%.

measures showed a high level of agreement in all cases, and did not point out any significant problem areas.

CHAPTER IV

SUMMARY AND DISCUSSION

Summary of Findings

The four specific objectives of this study were: (a) to formulate and design the telephone procedures for gathering post-hospital data on spinal cord injured persons, (b) to develop a category system for activities based on rehabilitation professionals' judgments, (c) to assess agreement between the self-report diary method and the telephone interview methods of collecting behavioral data, and (d) to use the resulting information to refine the telephone interview format and procedures. All of these objectives have been achieved.

A procedure was developed for recording activity information from spinal cord injured as well as nondisabled persons, using the telephone interview. This format facilitates quick transfer of verbal information into written records using vertical spacing and ditto marks, a large number of activity units per page, and a procedure for the interviewer to follow in obtaining a full record of a person's daily activities in time sequence, along with accompanying information on settings and companions.

Professionals in rehabilitation were asked to develop a set of categories which would be meaningful to them in clustering behaviors of disabled and nondisabled persons in a community environment. Inter-sorter agreement was generally quite high, and the few problems which arose were dealt with through more definitive category descriptions.

Assessments of coder reliability were performed on a subset of the 6 weeks of data for activities, assistants, companions and locations. Conversations were dropped from analyses since that measure was redundant with the companion measure. The mean agreement between coders in coding the various information units was above 90% in the first three cases. Agreement in assigning code labels for locations was only slightly lower, 84.2%, due in part to some seeming overlap in a few location code descriptions. These high percentages further testify to the usability of the coding system. Its meaningfulness is evidenced by the fact that the activity categories were chosen and developed by rehabilitation personnel with professional use in mind.

The multi-trait/multi-method approach to assessing convergent and discriminant validity showed high correlations between modes for the same measures, much lower correlations between different measures within one mode, and somewhat lower correlations between measures between modes--strong evidence for validity of the measures.

Correlations between modes for 10 derived measures on two sets of comparisons were extremely high, averaging above .85. The analyses could have been terminated at this point, since change data are a measure of primary interest for professionals examining post-discharge success in rehabilitation. However, exploration of the absolute differences generated by the various methods was deemed important in order to validate the use of telephone interview data as indicators of exact levels of performance.

Some t-tests were calculated for correlated measures to compare the absolute values generated by the various modes of data collection. When

some significant differences appeared at this level, scatterplots were constructed to show clearly the relationship among the data points. The scatterplots showed that there were only slight differences between the self-report and telephone interview modes, demonstrating clearly the sensitivity of between group comparison tests when the groups of data are very highly correlated.

Analyses of variance were conducted for 10 derived measures on the frequency data for each of the two comparison groups in order to ascertain main effects for disability and mode, and any potential interactions. Of the 20 analyses thus conducted, only three significant mode effects appeared. A subject by subject graphing of the data again showed that the absolute differences in the data points were very slight. None of the significant main effects for disability were contrary to expectations, but in general seemed to be in agreement with professional notions about the effects of a spinal cord injury on a person's lifestyle. Some disability effects which might have been expected did not, in fact, reach statistical significance. Perhaps this can be partially explained by noting that the disabled persons in this study had not incurred their disabling injury within the previous few years, but had been out of a rehabilitation hospital and back in the community for a number of years, during which time they had largely reintegrated themselves into home and community lifestyles.

In order to assess the amount of overlap between the diary and interview-generated distributions of frequencies, Tilton's measure of overlap was applied to the 10 derived frequency measures for the D/Ie and D/Ime comparisons. The results were conclusive--in none of the

comparisons across modes was the amount of overlap less than 89.85%. These extremely high percentages of overlap demonstrated that there was no difference between the distributions (Danford, 1974; Dunnette, 1969).

Although this study repeatedly showed the high agreement between frequency data generated through diaries and telephone interviews, thus demonstrating the efficacy of the interview procedure, the investigator decided to briefly examine some duration measures. For these elapsed time analyses, an examination of each of the categories of behaviors, persons and locations would serve to supplement the numerous tests of derived frequency measures.

Correlations were quite high (.75 or above) for all categories of activities except "fleeting communication," which was .64 in the D/Ime comparison and .73 in the D/Ie comparison. Even this lower correlation was still high enough to reject the null hypothesis of no correlation ($p < .01$). When overlap analyses using Tilton's method were performed on the elapsed time data, the lowest amount of overlap was 88.20%. This effectively showed that for category by category comparisons using elapsed time data, the overlap between the various modes of data collection was extremely high.

Correlations for person codes (i.e., assistants and companions) were also very high (above .85) except in the one D/Ime comparison for "co-workers and classmates" (.69); and in all cases the null hypothesis was rejected ($p < .001$). Overlap percentages were again quite high, in no case under 89.19%.

For location codes, correlations were .87 and above, in all instances reaching significant levels ($p < .001$). Overlap percentages ranged from

100% to 95.36%, well above the 80% criterion for finding no difference between the distributions.

Implications of Category Development and Information Units

Although many behavior category systems have been created by investigators for use in various studies, the activity category system used in this study was created by rehabilitation professionals operating on 703 different activity descriptions gathered from disabled and nondisabled persons' reports of their daily activities in the home and community environment. The rehabilitation professionals were instructed to create categories which were meaningful to them, so as to enhance the generalizability of the category system to other studies and settings where the activities of disabled persons are of interest.

Both activity and person category lists did not cause any problems for coders. However, the location codes seemed to present a few problems since some confusion was perceived between the "work" category and other education and service codes. Although the "work" location code enabled the quick retrieval of work related information for all subjects, not all coders used it correctly to supersede other codes, such as "educational office" or "clinic setting." In future studies, it might be more efficacious to eliminate the "work" category and retrieve work related information, subject by subject, using each individual's place of employment separately.

Companions and conversation, as information units, were redundant in this study. Conversation had been conceptualized as a some-or-none

measure, and subjects nearly always reported conversations whenever they mentioned companions. In future studies, it might be more meaningful to gather a different level of conversational information, for instance, fleeting conversation versus relatively continuous conversation with companions. Or, perhaps one could ascertain whether the conversation was directly relevant to the activity, such as receiving instructions on how to do something, or irrelevant, such as a discussion about a class at school during a bridge game, or a combination of both, such as a conversation about clothes as well as politics during a dressing activity. A combination of both these ideas could also be used with a little extra effort.

Although the companion codes presented no difficulty for coders, this study's definition of companions (to include all those persons in the general area of the activity) could be reformulated in the future so it would apply only to those persons who participated directly in the activity along with the target person for at least five minutes. Examples using this definition of companions are: attending a concert with a friend (which would not include the person who assists in seating), getting library books (which would not include the check-out person).

Future research probably should reformulate the definition of assistance so that it would generate a list of those persons without whose help the activity could not have been completed-or-who provided direct aid for at least half of the duration of the activity. In this way, assistance would encompass only major or necessary aid, rather than the brief courtesy of opening a door by a friend, or being handed a shirt to wash while putting the clothes in the machine.

Utilization of the Telephone Interview

The telephone interview relieves the subject of much responsibility and effort, thereby enabling the researcher to gather data over long periods of time, something which was not feasible with the self-report diary procedure. Also, the procedure results in a rich data base which provides answers to a wide variety of questions about persons' life-styles.

The telephone interview is easy to conduct, taking only 15 or 20 minutes on the average. It requires a minimum of time for instruction in the process. Materials are inexpensive--paper and pencil for the interview, and coding sheets for computerized data analysis if desired. The coding process is reliable and easy to learn. Even inexperienced persons were in high agreement with trained coders. Each of the subjects in the present study reported enjoying the telephone interviews and the personal contact they provided.

In the future, interviewers might visit each of the subject's homes once if possible to become acquainted with the home environment and establish social contact with the subject and nuclear family. An assessment of a disabled person's negotiability of the home environment (Norris-Baker, 1978) on such a visit could provide one way to check on the reliability of the interview data as well as gain some additional information about the person's behavior-environment interactions. For instance, if a disabled person reports that he transported into the yard from the living room without assistance, and the negotiability assessment has shown that he or she requires assistance to get the wheelchair down the step, then

either the disabled person has learned a new independent behavior or has simply forgotten about the assistance, in which case the interviewer's question will serve as a prompter.

Generalization of the Telephone Interview

Already the telephone interview format has been used in another research setting, M. D. Anderson Hospital and Tumor Institute, Houston, Texas, in following the rehabilitation trajectories of cancer patients after surgery is completed and they are released (Edens & Lawson, 1978). Also, a similar recording of activities using face-to-face interviews between researcher and subject was developed and tested by Stephens (1978). That technique proved to be in high agreement with companions' reports of mutually shared activities.

In addition, a study comparing the telephone interview format and direct observation at the Texas Institute for Rehabilitation and Research, Houston, Texas, is presently being designed by the Behavioral Ecology Research Team.

Since normal, nondisabled people with various demographic characteristics comprised half of the subject pool in this study, and numerous home, community, education, clinic, service and recreational settings are represented in the data, there appears to be high generalizability of the telephone interview format to a wide variety of persons and settings. The subject matter of the data is behavior, and the method of collection is by telephone--both are pervasive phenomena across persons and settings. Thus, the generalizability of the telephone interview should be extremely high in all areas.

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APPENDIX A

BASIC DEFINITIONS

BASIC DEFINITIONS

TIME

Refers to the beginning time for each new activity. There should be no gaps or time not allotted to some activity, since the beginning time for each new activity is intended to represent the end point of the activity that went before it. Recalling times is easiest at those points where you change settings, e.g., leave home for school or work. If you make mental notes during the interview day at the times when you make these sort of setting changes, the intervening times can then be estimated in the evening much more accurately.

ACTIVITY

Is a report of what you are doing behaviorally (for instance, eating a meal, dressing, bathrooming, doing school work, watching TV, grooming, a long telephone call, transporting between settings). If you are doing more than one thing at the same time, such as eating and watching TV, give each with the appropriate time intervals, some or all of which will be overlapping, as well as the rest of the accompanying information. The end of the longer activity is given as the beginning time for the next occurring activity. The activity you record should be molar in nature. You would record watching TV, but not each of the programs. Likewise, you would record eating, but not all the individual parts, although you must remember if you received assistance for any of these parts, such as someone helping you put an orthosis on at the beginning of eating.

ASSISTANCE

Refers to the actual physical doing of the activity. Did anyone help you with parts of the activity or the entire activity in any way, such as handing you cards in a card game, or helping you dress? Even if the aid was very brief, try to remember it and the person who helped you.

LOCATION

Is a short description of the location(s) in which activities occurred (for instance, office, bank, schoolroom, etc.). When at home give the actual rooms in which the activity occurred, such as kitchen for eating breakfast. An address may need to be given at first for unfamiliar or new settings, such as a new friend's home. This will help in determining the distances travelled.

COMPANIONS

Describe the people within hearing distance during the activities, such as two friends--one male, one female, or parents, or a group of about 10 friends. Note if they are actually participating with you as assistants during the activity.

CONVERSATION

Lists the different persons with whom you talked during the activity--mother, sister, friend, uncle, etc. The aim is to determine all the different people, not how often or long you spoke with each person.

APPENDIX B

NOTES FOR INTERVIEWERS

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1. The data day for interview data and diary data is from the time a subject awakes until 9:00 p.m.

2. Midday interviews should be done between 11:00 a.m., and 2:00 p.m. if at all possible.

3. Evening interviews should be done after 9:00 p.m.

4. On midday+evening interview days, the midday interview ascertains what the subject did from the time he awoke until the time of the interview; and the evening interview begins with you running through the information they gave you about their last midday interview activity to determine if it continued after the interview, and then ascertaining what they have done between then and 9:00 p.m.

5. On evening only interview days, call after 9:00 p.m. and have the subject tell you what he has been doing from the time he awoke until 9:00 p.m.

6. Remember not to list activities under 5 minutes in length, and remind the subject that this is the minimum length of an activity for his reporting.

7. Encourage the subject to remain consistent in terms of how he conceptualizes activities, for instance, A.D.L. versus bathrooming, grooming, bathing, across both modes and time during the study.

8. Note the number of contact calls you made for each given interview (as it might take several calls before he or she answers).

9. Midday+evening interviews should be done on different interview forms.

10. Note down how long it took you do do the interview.

11. Note any feelings or reactions the subject conveys, but do not solicit this information or encourage any viewpoint.

12. Fill in the upper right hand corner information for each interview.