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ADAPTIVE BEHAVIOR AND THE PROXEMIC STUDY OF A SMALL GROUP OF SEVERELY MENTALLY RETARDED CHILDREN

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ABSTRACT OF THESIS

The study sought to develop a method for recording and analyzing some of the patterns of the proxemic behavior of a small group of retarded children. It further sought to determine whether or not there were reliably measureable proxemic group behavior and individual differences in the proxemic behavior of mentally retarded subjects who were not significantly different in behavior patterns measured by an adaptive behavior scale.

The four subjects used in this study were observed in a small rectangular room. A photographic record was made at two minute intervals of the positions of the subjects in the room. From this record measurements of the distancing behavior between subjects was made.

The results have shown that subjects who had no significant differences in adaptive behavior, as measured by an adaptive behavior scale, exhibited significant differences in proxemic behavior. Not only did individual differences become apparent, but also reliably measureable proxemic patterms emerged for the group.

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CHAPTER I

INTRODUCTION

This study was an attempt to introduce proxemic research to the problem of measuring adaptive behavior. The subjects studied were severely mentally retarded children taken from the patient population of Parsons State Hospital and Training Center, Parsons, Kansas, an institution for mentally retarded children between the ages of six and twenty-one years.

An attempt was made to show the relevance of proxemic studies to adaptive behavior by a review of the literature in both fields. Experimental data have been presented to show that proxemic data expose significant differences in individual behavior that are inaccessible to current adaptive behavior measurements.

Need for the Study

A review of the literature of proxemics, i.e., man's distancing behavior, indicated possible application of proxemics study to the habilitation of socially maladaptive individuals. A number of behavioral measurements have been used to seek the requirements that society

imposes on the individual and also to measure the individual's ability to meet these expectations.

Most of the measuring instruments in use today are based in some way upon an analysis of the conscious attitudes of the people making up the social group in question. In the case of the adaptive behavior project at Parsons State Hospital and Training Center, moving picture films were made showing retarded children interacting with normal people in various public and social situations. These films were then shown to groups of people in various communities under study. The people viewing the films were afterwards asked to specify the behaviors that disturbed them most.

Also an analysis was made of the kinds of incidents involving mentally retarded children which would lead to disciplinary action by hospital workers and special education teachers. From these two sources of information an adaptive behavior checklist was constructed. This checklist made possible the rating of an individual's behavior in the areas found to be most critical for social acceptance.

Measurements such as the Adaptive Behavior Scale rely upon conscious attitudes toward specific behaviors for their construction. After such measurements are constructed they are put into the hands of users who will

again have to rely upon their abilities of observation in order to assess the individual's behavior.

Proxemic studies have indicated that there are rather extensive areas of human interaction that are not normally conscious. An individual may be socially unacceptable to a group of people yet neither the individual nor the group are really aware or able to verbalize the reasons for the unacceptability.

This study was initiated in order to see if it was possible to apply measurements to some of these unconscious attitudes that were not reached by previous techniques of measurement. Specifically, the technique of proxemic behavior measurement was explored for its potential usefulness as an extension of the current methods of measuring adaptive behavior in mentally retarded children. If it can be determined that one of the areas of maladaptive behavior is that of proxemics, then we will have gained one more area of behavioral observation that we may take into account in our attempts to integrate the socially maladaptive individual into society.

The Problem

This study sought to develop a method for recording and analyzing some of the patterns of proxemic behavior of severely retarded individuals and to explore the relevance

of such patterns to the assessment of adaptive behavior. A review of the literature has given indications that proxemic behavior may be an important element of adaptive behavior. The study, through the collection of experimental data, further sought to determine whether or not there were reliably measureable individual differences in the proxemic behavior of mentally retarded subjects who were not significantly different in behavior patterns measured by an adaptive behavior scale.

Limitations of the Study

Due to the limited number of subjects, this study was not able to make a comparison between the proxemic behavior of the subjects studied and other groups of individuals. The study was limited to discovering whether or not these subjects exhibited reliably measureable differences in proxemic behavior. To develop proxemic measurement as a useful tool in adaptive behavior, studies must be made to assess the proxemic requirements of the community into which the individuals in question are to be placed. The proxemic measurements of the subjects in this study were restricted to one environmental setting. How these same subjects would behave in other settings was beyond the scope of this study. The results of this study indicated that further research extending beyond

the limitations of this study are justifiable.

Statement of the Hypotheses

Three hypotheses were proposed for this study. The first hypothesis was proposed in order to discover whether or not there was any consistent pattern of proxemic behavior to be found in the group as a whole. This hypothesis deals with inter-subject comparison of the mean distancing behaviors of each subject. Following is a statement of hypothesis number one:

> When subjects are ranked according to relative distancing behavior, the frequency of specific rank relationship does not significantly differ from random expectations.

If hypothesis number one was rejected then the alternate hypothesis was accepted. The alternate hypothesis states:

> These subjects arrange themselves in a specific rank order of distancing behavior which differs significantly from a chance expectation.

A naive observation of the four subjects studied did not lead to an immediate impression of any purposeful behavior. The four subjects had very little apparent interaction with each other or objects in their environment. The overall impression was one of random distancing behavior. Therefore, hypothesis number two was proposed to determine whether or not each subject's distancing behavior conformed to a random distribution.

> The frequency of occurrence of specific distances between subjects does not differ from a random distribution.

In the event that hypothesis number two was rejected then the following alternate hypothesis was accepted.

> Individual subject's distancing behavior differs significantly from a chance expectation.

To determine whether or not there were any significant differences between individual subjects in their distancing behavior, hypothesis number three was proposed.

> The mean distancing behavior for each subject does not differ between subjects.

The following hypothesis was proposed as an alternate to hypothesis number three. If hypothesis number three was rejected then the following would be accepted.

> Significant differences exist between individual subject's mean distancing behavior.

Definition of Terms

Adaptive Behavior: The traditional tool in dealing with the classification and habilitation of the mentally deficient has been the IQ score. In assessing individuals of subnormal mental capability the IQ score has not been able to provide adequate information concerning the individual's ability to maintain his personal independence in everyday situations, nor does it guage his ability to meet the social expectations of his environment.

In 1961, the American Association on Mental Deficiency proposed that diagnosis of deficiencies in the mentally retarded be demonstrated in two general ways -- Measured Intelligence and Adaptive Behavior. It was stated:

> The dimension of Adaptive Behavior refers primarily to the effectiveness with which the individual copes with the natural and social demands of his environment. It has two major facets: (1) the degree to which the individual is able to function and maintain himself independently, and (2) the degree to which he meets satisfactorily the culturally-imposed demands of personal and social responsibility.
>
> Adaptive Behavior is a composite of many aspects of behavior and a function of a wide range of specific abilities and disabilities. Behaviors which have been subsumed under the designation of intellectual, affective, motivational, social, motor, etc., all contribute to and are a part of total adaptation to the environment ... level of function on the Measured Intelligence dimension will correlate with level of Adaptive Behavior. There will be, however, frequent individual discrepancies in levels of performance on the two dimensions.[1]

In 1964, under a grant from the National Institute of Mental Health, the Adaptive Behavior Project was begun at Parsons State Hospital and Training Center, Parsons, Kansas, under the direction of Dr. Henry Leland. The goal of this project was to develop an objective, scientific measure of adaptive behavior. To effect a suitable measuring device it was necessary to have (1) the knowledge concerning the individual's present behavior patterns

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[1]Heber, R., "A Manual on Terminology and Classification in Mental Retardation," Monograph Supplement, American Journal of Mental Deficiency, Second Edition, 1961, p. 61.

and traits, and (2) the knowledge concerning the requirements and demands of the environment. In developing the Adaptive Behavior Scale items relevant to the requirements of the social environment were derived from the analysis of the conscious attitudes of persons who played a large role in the retardate's environment.

Proxemics: Hall has coined the term "proxemics" for the study of human distancing behavior.[2] Most of this behavior normally lies outside our conscious awareness and therefore would fail to appear through attitude analysis. Hall delineates three major areas of proxemic study. The study of fixed feature space would analyze man's use of space in designing lasting structures such as buildings, parks, and cities. Semi-fixed environmental features would include arrangements of furniture and other moveable objects that help define our use of space. Dynamic space studies approach the question of how man manipulates the spatial features of his relationship with others.[3] The question of how man influences his communications by manipulating these various spaces is central to the study of proxemics. If accurate and reliable techniques can be

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[2]Hall, Edward T., "A System for the Notation of Proxemic Behavior," American Anthropologist, 65:1003-1026, 1963.

[3]Hall, E.T., "Proxemics: The Study of Man's Spatial Relations," Man's Image in Medicine and Anthropology Monograph IV, ed. Galdston, I., New York: International Universities Press, Inc., 1963, p. 429.

developed to measure the proxemic behavior of the individual and the proxemic requirements of the environment to which the individual must adapt, then a measure largely free of conscious distortion will have been gained. As Hall stated:

> Unlike much of the traditional subject matter of anthropological observation, proxemic patterns, once learned, are largely maintained out of conscious awareness and thus have to be investigated without resort to probing the conscious minds of one's subjects.
>
> Indeed, the very absence of conscious distortion is one of the principle reasons for investigating behavior on this level, for any step taken to eliminate a subject's conscious manipulation of the facade presented to the world is desireable.[4]

The terms "retarded" and "mental defective" will follow Heber's definition by referring to subnormal intellectual functioning originating during the developmental period and related to a deficiency in adaptive behavior.[5]

Plan of Study

The four subjects used in this study were placed in a rectangular room which measured sixteen by twenty-four feet. During the observation periods no other individuals were allowed in the room. Subjects were provided

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[4]Hall, "A System ...," op. cit., p. 1003.

[5]Heber, op. cit., p. 58.

with toys with which to play if they so desired. The room was observable in its entirety through windows along one wall. A photographic record was made at two minute intervals of the positions of the subjects in the room. This film record was later transferred to recording sheets that enabled the experimentor to measure the physical distances between the subjects. These distances then became the raw data which were used to test the three hypotheses. Basically, two types of proxemic information were gathered in this study: the actual distance between two subjects and the mean distance between each subject and all other subjects. It was assumed that the first type of data would present information of a more individual character; the second type of data would provide information based upon the group as a whole. This was done in order to have both individual and group data.

In the following chapter the literature of proxemics and adaptive behavior is surveyed in such a way as to point out the importance of each to the other. The main thrust of the argument presented is that many of the proxemic examples of cross-cultural conflict fit the paradigm of the adaptive behavior concept.

CHAPTER II

SURVEY OF LITERATURE

Most of the material published in the areas of proxemics or adaptive behavior have been published in the last ten years. Both of these areas are relatively new areas of research and therefore the body of literature available is not extensive.

Proxemics

The study of proxemics was first suggested by the early research dealing with animal behavior. These originated with H.E. Howard forty-seven years ago.[6] Later work centered upon the observation relating to territoriality involving such things as "flight distance" (how close an animal can be approached before it flees), "social distance" (the distance beyond which some vertebrates lose contact with their kind), and "personal distance" (the normal spacing between individual animals.)

One of the most interesting experiments with animal distancing behavior was done by J.B. Calhoun, involving

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[6]Howard, H.E. Territory and Bird Life. London: Murray, 1920.

special arrangements of pens for populations of white domestic Norway rats.[7] This arrangement of the pens caused pathological crowding and Calhoun applied the term "behavior sink" to describe this condition. The behavior sink was characterized by the disruption of nest building, care of the young, reproduction, and social organization. In addition, the animals suffered serious physiological pathologies.

> The development of a behavioral sink leads to ... a state of sustained inordinate aggregation which may be called a pathological togetherness.[8]

Christian and Davis in similar experiments discovered in field studies of populations of rodents, lagomorphs, and deer, a behavioral endocrine feed-back system which limited the population after a certain population density occurred. Above a certain point population density created endocrine anomalies which caused large scale die-offs not related to scarcity of food or other such environmental factors.[9]

These and similar studies have revealed that space can be a critical element in the welfare of some life

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[7]Calhoun, J.B., "Population Density and Social Pathology," Scientific American, 206:139-148, 1962.

[8]Calhoun, J.B., "A Behavioral Sink," 1961 (Mss), cited by Hall, "Proxemics: The Study...," loc. cit., p. 427.

[9]Christian, J.J. and Davis, D.E., "Endocrines, Behavior, and Population," Science, 146:3651, Dec. 18, 1964, pp. 1550-1560.

forms. The next logical step was to direct these efforts toward the study of the effects of space upon man.

Spatial Study of Man

Among the researchers who devoted their major efforts to the study of man's spatial relationships was Edward T. Hall, who developed three areas of proxemic study: (1) fixed feature space, (2) semi-fixed environmental features, and (3) dynamic space.[10]

Fixed Feature Space: Fixed feature space refers to the more permanent spatial arrangements of the environment. The way we arrange our buildings, streets, parks, and our cities are prime examples of this type of space. These rather fixed features can also be internal culturally-specific configurations. Hall gives us the following examples.

> Our concept of space makes use of the edges of things. If there aren't any edges, we make them by creating artificial lines (5 miles west and 2 miles north). Space is treated in terms of a co-ordinate system. In contrast, the Japanese and many other people work within areas. They name 'spaces' and distinguish between one space and the next or parts of the space. To us a space is empty -- one gets into it by intercepting it with lines.[11]

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[10] Hall, "Proxemics: The Study ...," loc. cit, p. 429.

[11] Hall, E.T., The Silent Language. Garden City, New York: Doubleday and Co., Inc., 1959, p. 203.

The realization of how much our fixed feature space affects our welfare has been a consideration in a number of studies concerned with the effect of hospital space arrangement upon patients. Osmond and Izume have suggested radical changes and alterations in our conventional designs of mental hospitals.[12] They have suggested that the conventional use of space in mental hospitals is actually anti-therapeutic. They designed a radial pattern for the hospital lay-out, with the nursing staff and administration situated in the center or hub, and the surrounding area provided a community day-room in which large groups could meet. In the area furtherest from the center were smaller rooms of sufficient size for two to four people to interact; beyond this were small individual rooms where the patient could shut himself off from others.

Such studies as those of Izume and Osmond, as well as those of Weckowitz, would have a great utility in a program of designing spatial features of hospitals. Wecko-

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[12] Izume, K., "An Analysis for the Design of Hospital Quarters for the Neuro-psychiatric Patients," Mental Hospitals, (April Architectural Supplement), 1957; and Osmond, H., "Function as the Basis of Psychiatric Ward Design," Mental Hospitals (April Architectural Supplement), 1957, pp. 23-29; and Osmond, H., "The Historical and Sociological Development of Mental Hospitals," in Psychiatric Architecture, ed. C. Goshen, Washington, D.C.: American Psychiatric Association, 1959, pp. 7-9.

witz, in studying the schizophrenics' perceptual world, has discovered consistent misjudgments as to size and distance of objects.[13] Environments created for schizophrenics would have spatial features peculiar to the specific therapeutic needs of the patients. Likewise, patients with other disorders would have different environments.

Hall comments on the small size of some hospital rooms.

> In another hospital also in Washington, a private room in the surgery ward is so small that people constantly comment on its size. The ward staff have found that certain patients deteriorate in this room, and have to be moved. There is undoubtedly a point at which spatial economics begin to bring diminishing returns. We need to know the ideal room size for treating different conditions.[14]

Some of the different perceptions of fixed space that exist between different cultures have been well illustrated by Sollenberger.[15] He tells of the moving of a complete four-story hospital building from the United States to the center of China. After reassembling it, the Chinese disliked it intensely. Later, when the Chinese Communists came to power, the hospital was torn down and

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[13] Weckowitz, T.I., "Notes on the Perceptual World of Schizophrenic Patients," Mental Hospitals (April Architectural Supplement), 1957, pp. 23-24.

[14] Hall, "Proxemics: The Study ...," loc. cit., p. 432.

[15] Sollenberger, H., Orientation Lectures Given to Point IV Technicians Attending the Foreign Service Institute, Department of State, 1951-1955.

reassembled along patterns more familiar to the Chinese. Instead of wards, small huts were built to house individual patients and their immediate family, who were thus able to help take care of them. This proved much more satisfactory to the Chinese, who then began to use the hospital facilities more frequently.

Semi-fixed Environmental Features: Semi-fixed spatial features include those aspects of our environment that we occasionally alter. The research in this area deals with man's arrangement of furniture to control his interaction with others. The principal investigator in this area has been Robert Sommer.

Sommer's first study dealt with the question of the way in which people arrange themselves when interacting in small discussinn groups.[16] The setting for his research was a cafeteria in a mental hospital. Chairs were placed around a rectangular table so that subjects could be described as sitting opposite one another, along side one another, at corner positions, or at some distance from each other. He discovered that the subjects had certain seating preferences. Females would sit closer to females than to males; this was also closer than males would sit to either sex. Schizophrenics appeared to have an impaired

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[16]Sommer, R., "Studies in Personal Space," Sociometry, 22:247-260, 1959.

concept of social distances, as they usually seated themselves so as to create greater interpersonal distances.

Sommer also did a study on leadership where he found that leaders preferred the end positions at tables and that other people sit close by.[17] When the leader did select the end position, other people sat opposite or across rather than alongside the leader. Also a zone of comfortable conversation of five and one-half feet between people was discovered. Conversations began to diminish at distances greater than this.

In a later study concerning the distance of comfortable conversation, Sommer stated:

> These results conform to our previous finding that people prefer to sit across from one another rather than side by side. We have now learned two exceptions to this -- when the distance across is too far for comfortable conversation, and secondly, when the distance across exceeds the distance side-by-side. When the distances are equal or when the distance side-by-side exceeds the distance across, people strongly prefer to sit opposite one another, at least under the condition of the study.[18]

He also discovered in the study that the exceeding distance for comfortable conversatinn was related to the size of the surrounding area, e.g., longer seating distances

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[17] Sommer, R., "Leadership and Group Geography," ibid., 24:99-109, 1961.

[18] Sommer, R., "The Distance for Comfortable Conversation: A Further Study," ibid., 25, 1961, p. 115.

were more tolerable in small rooms than in large ones. Hall has also made observations relevant to this zone of comfortable conversation. He makes the point that what is conducive to certain types of interaction in one culture may have the opposite effect in another culture.

> Americans have great difficulty carrying on conversation across a room ... In the mountain village of Lebanon and Syria this is the accepted way for men to converse in the evening. They will sit on opposite sides of the room and talk across the room at each other, something that would be virtually impossible for Americans to do. [19]

Obviously the arrangement of furniture is an important determinant of human interaction. Arrangement can be made to discourage or encourage conversation. Osmond has noted these contrasting environmental forces and characterized them as "sociopetal" and "sociofugal."[20] According to Osmond sociofugal space discourages human interaction; sociopetal space has the opposite effect.

Man's Dynamic Use of Space: The following studies are indicative of the research on the more dynamic aspects of man's spatial behavior. Dynamic space is seen as the spatial behavior that we, so to speak, "carry" with us. These spatial behavior patterns are kept fairly intact as we move from one environmental situation to the next.

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[19] Hall, "Proxemics: The Study ...," loc. cit., p. 437.

[20] Osmond, "The Historical and Sociological Development ...," loc. cit.

Winick and Holt studied seating positions of patients in group therapy. They discovered that many patients avoided sitting on sofas in order to prevent being touched by other patients. They also noted a relationship between the level of group anxiety and whether or not the group seated itself in a circle. Group anxiety was expressed by a circular seating arrangement; as anxiety diminished, the seating arrangement became non-circular.[21]

Confusion as to the distinction between the patient's own physical boundaries and boundaries of the space he inhabits is not unusual. Searles[22] has noted such confusion and so also have Davie and Freeman.[23] These authors have not only noted the loss of body boundaries but other sorts of perceptual distortions. Schizophrenics were found to underestimate the size of objects seen at a distance. Such a person, therefore, typically would overestimate distances. It was noted that some patients reacted violently to being approached to closely. As therapy progressed, the patient was able to tolerate closer physical distances.

Placing people in environments that tend to exaggerate

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[21]Winick, C., and Holt, H., "Seating Positions as Non-Verbal Communication in Group Analysis," Psychiatry, 24:171-182, 1961.

[22]Searles, H., The Nonhuman Environment. New York: International Universities Press, 1960.

[23]Davie, J., and Freeman, T., "Disturbances of Perception and Consciousness in Schizophrenic States," British Journal of Medical Psychology, 1961.

feelings of anxiety related to their own spatial-perceptual distortions certainly should be eschewed in cases where the reduction of anxiety is a goal. One of the studies showing the relationship between anxiety and spatial perception was done by the United States Navy on bomb shelter occupancy. The study indicated that subjects typically report a perception of walls closing in on them upon entering the shelter. After initial anxiety decraases, they report feeling the walls recede.[24]

Hall has developed a system for the notation of proxemic behavior. He defines eight recordable dimensions: (1) postural-sex identifiers, (2) sociofugal-sociopetal orientation, (3) kinesthetic factors, (4) touch code, (5) retinal combinations, (6) thermal code, (7) olfaction code, and (8) voice loudness scale. Subsumed within each of these eight dimensions are numerical code systems. Using this system, differences in proxemic behavior can be recorded by key punch methods.[25]

In his most recent book, The Hidden Dimension, Hall analyzes the differences an proxemic patterns found among German, English, French, Japanese, and Arabian cultures. Some of these comparisons are quite astonishing and point

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[24]United States Navy, Preliminary Report on Shelter Occupancy Test 317 (USN Roh-TR-418), US Naval Radiological Laboratory, 1959.

[25]Hall, " A System ...," loc. cit.

out the diversity of meaning attached to similar behavior by people of different cultures.[26]

The relationship of proxemic behavior to adaptive behavior becomes readily apparent when the individual moves from the culture from which he gained his proxemic patterns to another culture which requires either different proxemic behavior or attaches a different meaning to the individual's behaviors. It was, in fact, such cross-cultural conflicts which aroused Hall's initial interest in proxemic behavior.

> The writer began systematic observations in a proxemic frame of reference when it became apparent that people from different cultures interacting with each other could not be counted on to attach identical meanings to the same or similar measured distances between them. What was close to an American might be distant to an Arab.[27]

However, it is not necessary to make cross-cultural comparisons to discover differences in proxemic behavior, since there are considerable differences found between sub-cultures.

> Cultures vary greatly in the amount of touching which occurs between people. Even in the United States, there are groups which participate in considerable touching and others whose members assiduously avoid touching anyone but those with whom they are intimate.[28]

What has been pointed out as a potential, unconscious

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[26]Hall, E.T., The Hidden Dimension. Garden City: Doubleday and Co., Inc., 1966.

[27]Hall, "A System ...," loc. cit.

[28]Ibid., p. 1011.

source of conflict in transcultural situations is also a source of conflict for the individual who has not successfully learned the proxemic patterns of his own culture.

> For example, the anthropologist knows that in spite of their apparent complexity, cultural systems are so organized that their content can be learned and controlled by all normal members of the group. Anything that can be learned has structure and can ultimately be analyzed and described.[29]

Adaptive Behavior

The American Association on Mental Deficiency first introduced the concept of adaptive behavior in 1959. By 1961 the concept, which included dimensions of maturation, social adjustment and learning, was made a part of the definition of mental retardation.[30] The best general discussion of adaptive behavior in the context of a systematic and experimental approach is to be found in the work of Helson[31] and his associates. Helson's work does not deal directly with mental retardation; however, Eyman[32] has attempted to tie mental retardation research to Helson's work.

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[29] Ibid., p. 1006.

[30] Heber, op. cit., p. 61.

[31] Helson, H., Adaptation-Level Theory. New York: Harper and Row, 1964.

[32] Eyman, R.K., "Co-variation of Level of Aspiration and Adaptation Level with Other Characteristics," American Journal of Mental Deficiency, 68(6): 741-750, 1964.

In one of the more recent textbooks, Jordan presents not only the usual arguments against the intelligence test as an efficient measurement but also develops suggestions as to how a behavioral measurement could be substituted. He describes the development of concepts of measurement from the Binet to adaptive behavior as a "nuclear concept which can clarify the complex behaviors called mental retardation."[33] Philips discusses maladaptive behavior in terms of interpersonal relationships of all levels of intelligence. He cites Garrard and Richmond, who suggest that "psychological adaptation is the central core of the biological, sociocultural, and psychological aspects of mental retardation."[34]

Cook drew material from a wide variety of sources, including literature on both adaptation and mental retardation. Although he concluded that adaptive behavior was a rather diffuse concept, he believed that two major components were indicated -- personal independence and cultural conformity.[35]

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[33]Jordan, T.E., The Mentally Retarded. Second Edition, Columbus, Ohio: Charles E. Merrill Books, 1966, p. 123.

[34]Philips, I., Prevention and Treatment of Mental Retardation. New York: Basic Books, 1966, p. 10.

[35]Cook, J.J., "A Conceptual Framework Within Which to View Adaptive Behavior in the Retarded," American Journal of Mental Deficiency, 71(1): 64-72, 1966.

Ellis included an entire section on adaptive behavior in his review of mental retardation research. Rather than presenting a particular description of coping behavior, he presented a growth and development type of model. He did, however, discuss environmental deprivation or enrichment, age variables, critical periods, early stimulation, and other factors which are all related to the whole problem of coping over and above questions of natural development.[36]

Heber pointed out that

> because of the imprecision of these norms and standards of adaptive behavior, intelligence test performance will remain as the most important and heavily weighted of the criteria used. In spite of obvious limitations, the individual intelligence test remains as the most objective and best single assessment technique currently available. Precise, objective measures of adaptive behavior, though extremely desirable, are for the most part, presently unavailable.[37]

Although the Vineland Social Maturity Scale (VSMS)[38] was the best available measurement at the time Heber made his comment (1962), in his opinions it was nevertheless so unsatisfactory that the IQ test was preferable.

A number of rating scales were designed to quantify observable behavior in several areas of daily living and to measure the social competency and level of adaptation

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[36]Ellis, N.R., ed., International Review of Research in Mental Retardation: I. New York: Academic Press, 1966.

[37]Heber, R., "Mental Retardation: Concept and Classification," Trapp, E.P., and Himelstein, P., eds., Readings on the Exceptional Child. New York: Appleton-Century-Croft, 1962, p. 72.

[38]Doll, E.A., Vineland Scale of Social Maturity. Minneapolis, Minnesota: American Guidance Service, 1964.

of the individual to his environment. All these scales were similar in nature to the VSMS.

The development of the Adaptive Behavior Scale, begun in 1964 and published in 1969,[39] was initiated with a review of the then current rating scales. Out of a review of these scales, a collection of behavior items judged to be critical in relationship to the adaptive behavior concept as proposed in the AAMD manual was drawn.[40] It was decided that the five level adaptive behavior classification system, currently in use at Parsons State Hospital and Training Center and other state institutions for mentally retarded in this country, should be employed for verification. In addition to this five level system, items were also evaluated in terms of (1) degree of discrimination between retardates who had been previously classified at different adaptive behavior levels, (2) degree of discrimination between the adaptive behavior levels while variance due to measured intelligence was controlled, and (3) interrater reliability. As a result, Part I of the scale was developed. It was designed to measure the

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[39]Nihira, K., Foster, R., Shellhaas, M., and Leland, H., Adaptive Behavior Scale, American Association on Mental Deficiency, Boyd Publishing Co., 1969.

[40]Leland, H., Nihira, K., Foster, R., Shellhaas, M., and Kagin, E., Conference on Measurement of Adaptive Behavior: II. Parsons, Kansas: Parsons State Hospital and Training Center, 1966; Nihira, K., Foster, R., and Spencer, L., "Measurement of Adaptive Behavior: A Descriptive System for Mental Retardates," American Journal of Orthopsychiatry, 38(4): 622-634, 1968.

the retardate's abilities in the maintenance of personal independence. The behavior items that were collected were divided into ten categories, or domains. These ten domains included Independent Functioning, Physical Development, Economic Activities, Language Development, Number and Time Concepts, Occupation (Domestic), Occupation (General), Self-Direction, Responsibility, and Socialization.

New behavior domains were hypothesized from the analysis of approximately 2,500 critical incident reports. Scale items in Part II of the Adaptive Behavior Scale were generated to provide measures for these hypothesized behavior domains. These domains are Violent and Destructive Behavior, Antisocial Behavior, Rebellious Behavior, Untrustworthy Behavior, Withdrawal, Stereotyped Behavior and Odd Mannerisms, Inappropriate Interpersonal Manners, Unacceptable Vocal Habits, Peculiar or Eccentric Habits, Sexually Aberrant Behavior, Self-Abusive Behavior, Hyperactive Tendencies, and Psychological Disturbances. While the scale cannot possibly represent all behavior problems described in the reported incidents, an attempt was made to obtain a comprehensive sample of coping behavior problems as revealed by the results of this investigation.

In order to establish the construct validity of the scale, a series of factor analyses were performed using

the twenty-two domain scores from both Part I and Part II of the scale. The study delineated three major dimensions of adaptive behavior: Personal Independence, Social Maladaptation, and Personal Maladaptation.[41] The factor of Personal Independence was defined primarily by (1) the behavior domains that represent the individual's skills and abilities required to maintain his personal independence, and (2) the behavior domains that suggest the presence of autonomy or motivation to manage his personal affairs. The factor of Social Maladaptation suggests a general dimension of extrapunitive antisocial behavior disorders. The factor of Personal Maladaptation seems to represent a dimension of intropunitive maladaptation.

> We believe that all of these domains are potentially important for the retardate's successful adaptation to his environment. Preliminary results of our sociological study suggest that the relative importance of each behavior domain varies in different environmental situations. The potential users of the A B Scale are urged to evaluate its practical validity with different criteria of retardates' adaptive behavior performance at varying environmental situations, and avoid over-simplification of the concept of adaptive behavior.[42]

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[41] Nihira, K., "Factorial Dimensions of Adaptive Behavior in Mentally Retarded Children and Adolescents," American Journal of Mental Deficiency, 1969 (in press); Nihira, K., "Factorial Dimensions of Adaptive Behavior in Adult Retardates," American Journal of Mental Deficiency, 1969 (in press).

[42] Nihira, K.," Description and Measurement of Adaptive Behavior: Why,What, and How," a paper presented at the annual meeting of the Kansas Psychological Association, Wichita, Kansas, April 12,1969.

The Adaptive Behavior Scale seems to be the most objective, scientific measurement of adaptive behavior developed to date. However, in seeking to measure the individual's ability to functinn within the social framework expected of normal people, it has not taken into account the domain of proxemic behavior, which, as was discussed previously, is a realm of behavioral expectation that can be quite critical to an individual's social adaptation. It has also been maintained that proxemic behavior is largely outside of conscious awareness; in addition, the expectations of proxemic behavioral patterns, like the criteria for adaptive behavior, vary from culture to culture and between subcultures.

Proceeding from indications in the literature of the potential application of proxemic measurements to the problem of the adaptive behavior of retarded children, a study was designed to measure the personal distancing behavior or four mentally retarded children. These children were determined to have no significant measureable differences in their adaptive behavior, as measured by the Adaptive Behavior Scale. The design of this study is presented in the following chapter.

CHAPTER III

DESIGN OF THE STUDY

The present study was designed to determine whether or not significant differences in behavior were reliably measureable in subjects by a proxemic approach that would not emerge in the domains presently included in the Adaptive Behavior Scale and other similar measurement scales.

Subjects

Four subjects were included in this experiment. All were ambulatory, severely mentally retarded male patients at Parsons State Hospital and Training Center, Parsons, Kansas. Their ages ranged from nine and one-half to fifteen years (mean = twelve years four months); the ranges of the VSMS scores were SQ ten to SQ thirty-one (mean SQ = eighteen). The adaptive behavior level as measured by the Adaptive Behavior Scale placed all four subjects well within Level V. Part I scores on the A.B. Scale ranged from 109 to 139 (mean = 124); Part II scores were fifty-four to sixty-three (mean = fifty-eight). The differences in the adaptive behavior score between subjects were less than the reliability of the measuring

instrument. Therefore, the subjects were assumed to be indistinguishable as to adaptive behavior level.

Physical Environment

The four subjects were observed in a rectangular ward room measuring sixteen by twenty-four feet. Three-inch wide, white lacquered lines were painted on the ward room floor as rectangular grid co-ordinates at four foot intervals. These lines clearly contrasted with the grey cement floor. One couch and four toys, a tricycle, a ball and two wagons were the only objects in the room during the period of observation. This room was the normal daytime living area for these boys. There was an entrance door locked at all times, an unlocked door at the center of one end of the room leading to rest room facilities, available at all times to the subjects, and a third door leading from the ward room to a corridor from which observations could be made through ward room windows. During the course of the observation, no outside interruptions were allowed in the ward room.

Equipment

A sixteen millimeter Pathe motion picture camera was used to record the positions of the subjects in the ward

room. The camera employed high speed, black and white reversal film; special lighting equipment was unnecessary. The camera was hand held and adjusted to make single frame exposures.

Procedure

For three weeks prior to the filmed observation the experimentor spent the hour between three and four p.m. every day in the observation corridor with camera in hand in order to allow the subjects to become accustomed to the change of routine. Between the second and third weeks the subjects appeared to have grown accustomed to this daily intrusion and lost further interest.

At the end of the third week of dry runs, the camera was loaded with film and the positions of the subjects in relation to each other and to the ward room and its contents was recorded in two minute intervals. Each recording session lasted approximately forty-five minutes, accumulating a total of twenty-two single frame shots. These sessions were continued for four consecutive days during the same hour each day, making a total of eighty-eight single frame exposures.

The film was then developed and data from the film were transferred to recording sheets specially constructed for this purpose (See Appendix M). The top half of the

recording sheet in Figure 1 is constructed as a plan of the rectangular ward room as seen from the vertical perspective; the one inch grid lines on the recording sheet represent the four foot grid lines on the ward room floor. By observing the position of the subjects in each individual frame, it was a relatively simple process to transfer these positions to the same positions on the recording sheet.

Once the subjects had been positioned properly on the recording sheets, straight lines connecting each subject with every other subject were drawn. Measurement of each of these lines produced the distances between each of the subjects. For each pair of subjects, these distances were recorded in the proper columns at the lower left of the recording sheet. The mean of the three distances between each subject and his three fellow subjects was derived and recorded. The total observable data were recorded on eighty-eight recording sheets, each representing the positions of the subjects at two minute intervals.

In order to test hypothesis number one, a ranking procedure had to be developed which would indicate the relative closeness of each subject to the group as a whole. The ranking procedure used can best be illustrated by viewing Appendix M, Figure 1. As can be seen, the

average distance of subject number one to the three remaining subjects was 7.6 feet, that of subject number two 9.3 feet, subject number three 9.0 feet, and subject number four 11.3 feet. This average distance provided a measurement of the relative isolation or closeness of each subject to all the other members of the group. For each of the eighty-eight observations, the subjects were ranked according to their relative average distance. In Figure 1 (See Appendix M), subject number four, with the longest average distance, was assigned a rank of one, subject number two was ranked second, subject number three was ranked third, and subject number one, with the shortest distance, was ranked fourth. The chi square test was chosen to test the significance of ranking patterns, since this test is most commonly used when data are in frequencies such as in the number of occurrences in different categories. The chi square test would show not only whether or not a specific ranking pattern occurred more often than another, but also if it did so occur what would be its level of significance.

In order to test hypothesis number two a distribution of observed individual distances was plotted by taking each subject's distance from every other subject recorded in the eighty-eight observations (for each subject, a total

of 264 times). All individual distances fell within a range of zero to twenty-six feet. A frequency distribution was plotted on the basis of the number of occurrences of each specific distance, e.g., subject number one was found to be seven feet from other subjects twenty times out of 264 observations. The observed frequency distribution of individual distancing behavior was normalized on the basis of mean distance, standard deviation, and number of observations. Again using the chi square method, the observed frequencies were compared to the expected frequencies (derived from normalization of the curve) for goodness of fit. This analysis provided information as to whether or not these individual distancing behaviors were significantly different from a random behavioral model.

Hypothesis number three was tested by a comparison between each subject's mean distancing behavior and that of each other subject in the group. The 264 distances measured for each subject were simply summed and then divided by 264 to obtain the mean distances. In each case a test was made to determine the significance of the difference between means. The .01 level of confidence was used as the criterion for acceptance or rejection of the hypotheses.

Proceeding from this design, the data were collected and analyzed according to statistical tests appropriate to each hypothesis. Hypotheses were accepted in some cases

and rejected in others. The results of these tests are presented in the next chapter.

CHAPTER IV

RESULTS

Three operations were performed on the collected date in order that it would be in a form most convenient for the testing of the hypotheses. The initial two operations, photography and subsequent transferral of information to the data recording sheets (See Appendix M), have previously been discussed. It was discovered that eighty-eight data recording sheets were cumbersome to handle. The third operation was performed to overcome this problem by presenting the recording sheet data in tabular form. The results of this third operation are seen in Tables IV through VII in Appendices A through D. Recorded for every observation of each subject (eighty-eight observations in all) are three distances. In Table IV (See Appendix A) these distances can be seen as nine feet between subjects one and two, twelve feet between subjects three and one, and six feet between subjects four and one. Table IV presents this information for subject one. Tables V, VI, and VII (See Appendices B, C, and D) present similar information for subjects two, three, and four, respectively. The mean of the three distances for each subject was computed for every observation. This mean is entered under the column

titled Mean Distance. In Table IV (See Appendix A) this mean is nine feet for the first observation. Each subject was ranked according to his mean distance. The subject with the highest mean distance for a specific observation was ranked number one; the subject with the lowest mean distance was ranked number four. On occasion two subjects had the same mean distance. In such cases the rank order was divided between the subjects as is the normal practice in the case of rank ties. In Table IV it can be seen under the column titled Rank Mean Distance that subject one was ranked third relative to the other subjects for the first observation. The following tests for the hypotheses all draw their basic data from Tables IV through VII, Appendices A through D.

Test of Hypothesis Number One

Hypothesis number one was posed in such a way as to try to discover evidence of any group structure in respect to relative distancing behavior. If some pattern emerged then it would mean that relative isolation or intimacy with respect to the group would emerge as a predictable pattern for each subject. If, on the other hand, no pattern emerged, it would mean that at any given time any subject would be equally likely to be the group isolate or the group intimate.

Each subject had some rank relationship to every other subject for a total of eighty-eight observations. It was decided to apply the chi square test since this type of data is easily presented in frequencies. Table I presents the chi-square tabulation.

TABLE I

CHI SQUARE OF MEAN DISTANCE RANKS

Ss	88	88	88	88	
4	9	16	39.5	23.5	88
3	2.5	12.5	32	41	88
2	32	32	9	15	88
1	44.5	27.5	7.5	8.5	88
	1 longest distance	2	3	4 shortest distance	rank

$X^2=130.54$ df=15

Each subject is identified from top to bottom under column Ss and the relative rankings from one to four are presented across the bottom of the table. It shows, for example, that the mean distance rank for subject one was highest 44.5 times, was second highest 27.5 times, was third highest 7.5 times, and was lowest 8.5 times in eighty-eight observations.

If various rankings occurred by chance, then the expected frequency for each cell would be twenty-two since all ranks would be equally likely for each subject.

As can be seen in the table, subject number one typically maintained the longest distances from other members of the group, subject two was ranked second, subject four was ranked third, and subject three was ranked fourth. To test the significance of this pattern, the observed frequencies were compared to the expected frequencies and a X^2 of 130.54 was obtained. With fifteen degrees of freedom the probability was less than .01 that hypothesis number one would be acceptable. Since the criterion for acceptance or rejection of the hypotheses in the study was set at the .01 level of confidence, hypothesis number one is thus rejected and its alternate accepted.

Test of Hypothesis Number Two

In order to test hypothesis number two it was necessary to construct a model of individual random distancing behavior. A z distribution of the frequencies of occurrence of distances between zero and twenty-six feet was chosen for this model. Such a distribution makes extremely close and extremely far apart distances less likely than distances more mediate.

In order to construct a z distribution for each subject

it was first necessary to find the mean and standard deviation of the 264 distances maintained by each of the subjects.

Table II identifies each subject in the left column, gives the respective mean distances in the middle column, and the standard deviations in the right column.

TABLE II

MEANS AND STANDARD DEVIATIONS FOR SUBJECTS' DISTANCE MEASUREMENTS

Subject	Mean Distance (in feet)	Standard Deviation (in feet)
1	12.15	5.47
2	11.38	4.80
3	8.31	10.43
4	9.08	9.75

Using the information in Table II a z distribution was constructed for each subject. Table VIII (See Appendix E) presents the development of the z distribution, or normalization, for subject one.

The following operations are presented in Table VIII (See AppendixE). Column f_o presents the frequency of the occurrences of the distances shown in column D for subject one. The remaining informatinn includes the steps necessary

to derive the best fitting normal distribution for the observed frequencies in column f_o. After determining the upper limit of each interval, the values in the x column were derived by subtracting the mean from each of the upper limits. Column z contains the result of dividing each of the x values by the standard deviation. The proportion of the area of the normal curve to be found between each of these z scores was found by reference to a normal probability table. The proportion of cases found within each interval was then computed. The expected frequencies (column f_e) were found by multiplying the number of cases (264) by each of the values found in the column designated Proportion Within.

Having obtained both observed frequencies of individual distancing behavior and expected frequencies based upon a z distribution, it was possible to apply appropriately the chi square test to the data. Table IX (See Appendix F) presents this test of the data for subject number one. In Table IX, columns f_o and f_e contain the observed and expected frequencies of occurrence for the appropriate distances in column D. Column $f_o - f_e$ presents the differences between the expected and observed frequencies; column $(f_o - f_e)^2$ presents the square of these differences. Finally, the squares of these differences were divided by their own expected frequencies and summed to obtain a

X^2 of 60. Figure 2 (See Appendix N) presents a graphic comparison of the observed and expected frequencies of the distancing behavior of subject number one.

Three restrictions were placed upon the data when it was normalized in Table VIII (See Appendix E), i.e., the mean, the standard deviation, and the number of cases. One degree of freedom was lost for each of these restrictions. Therefore, the number of degrees of freedom equals twenty-three (twenty-six intervals minus three restrictions). In a chi square table it was found for twenty-three degrees of freedom that the .01 value of chi square was less than sixty thereby rejecting hypothesis number two in favor of its alternate. This indicates that the frequency of the distancing behavior being considered departs significantly from that of a random distribution.

The identical procedure for the derivation of expected frequency and test for the goodness of fit between observed and expected frequencies was employed for subjects two, three and four. For subject two Table X (See Appendix G) presents observed and expected frequencies; Table XI (Appendix H) presents the test for goodness of fit, giving a chi square of 59.01, thus rejecting the secnnd hypothesis at a $\underline{P}$ less than .01. Figure 3 in Appendix O, presents a graphic comparison of observed and expected frequencies for subject number two.

For subject number three Table XII (See Appendix I) presents observed and expected frequencies; Table XIII, Appendix J, presents the test for goodness of fit, giving a chi square of 400.06, thus rejecting hypothesis number two at a P considerably less than .01. Figure 4 (See Appendix P) presents a graphic comparison of observed and expected frequencies for subject number three.

Table XIV (See Appendix K) observed and expected frequencies for subject number four; Table XV, Appendix L, presents the test for goodness of fit, giving a chi square of 453.00, thus rejecting the second hypothesis at a P less than .01. Figure 5 in Appendix Q presents graphic comparison of observed and expected frequencies for subject number four.

Test for Hypothesis Number Three

Having dealt with group patterns (hypothesis number one) and the comparison of individual behaviors to random models (hypothesis number two), attention was focused on more individualistic inter-subject differences. Hypothesis number three was proposed for an assessment of the significance of individual differences in distancing behavior.

A statistical test was chosen that would derive z scores for the differences between the means of the dis-

tancing behaviors of each subject. These means can be seen in Table II.[43] Six subject pair relationships exist when every subject is compared with every other subject. The six pair relationships are shown with their appropriate z scores and corresponding levels of confidence in Table III.

TABLE III

z SCORES AND P FOR THE DIFFERENCES BETWEEN MEAN DISTANCES

Ss	1	2	3	4
1		z=1.75 (P=.04)	z=3.94 (P=.001)	z=4.44 (P=.001)
2			z=4.44 (P=.001)	z=3.48 (P=.001)
3				z=.87 (P=.19)
4				

For example, Table III shows that the z score for the differences between the means of subject number one and subject number three is 3.94, rejecting hypothesis number three at a $P < .01$ showing that the difference in means between these two subjects is significant.

Table III shows that the third hypothesis was accepted because $P > .01$ for paired subjects one and two and for paired subjects three and four. However, the hypothesis is rejected in favor of its alternate for all other paired subjects, i.e., paired subjects one and three, one and four,

[43] Supra, p. 31.

two and three, and two and four. Or expressed in another way, paired subjects one and two are not significantly different from each other in their distancing behavior; the same is also true for paired subjects three and four. However, paired subjects one and three, one and four, two and three, and two and four are significantly different from each other.

As it has been a rather complex process to test the previous three hypotheses, an attempt was made to summarize the prior material in the last chapter; in addition, some suggestions have been made for further research.

CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

This study was undertaken for the purpose of investigating the possible use of proxemic measurements to aid in the measurement of adaptive behavior. A survey of the literature was made for both proxemics and adaptive behavior. From this survey of literature it was noted that researchers in the area of proxemics were discussing their observations in terms relevant to adaptive behavior.

It was pointed out that the items used to develop the Adaptive Behavior Scale were developed largely from assessments of conscious attitudes toward specific behaviors. It was also pointed out that since proxemic behavior was reliably measureable and at the same time largely outside of conscious awareness that it would provide a domain of measurement largely free of conscious distortion.

From several possible dimensions of proxemic behavior the distance between the individuals was chosen for this study. The distancing behavior of four male severly mentally retarded children was measured. Photo-

graphic film was used to collect the data, later to be transferred to grid coordinate recording sheets for distance measurements between subjects. The four subjects used in the study were chosen on the basis that there were no significant differences among them as determined by an adaptive behavior scale. Differences in proxemic behavior were sought between subjects who exhibited no measureable differences in adaptive behavior.

In searching for significant differences in proxemic behavior three null hypotheses were tested. It was determined for the purpose of this study that the hypotheses would be rejected at a confidence level of .01 or less and accepted at values greater than .01.

Hypothesis number one was rejected by a chi square test. The alternate hypothesis that these subjects arranged themselves in a specific rank order of distancing behavior was accepted.

Hypothesis number two was also rejected by a chi square test. The alternate hypothesis that individual subject's distancing behavior differs significantly from a chance distribution was accepted. This would not be surprising if it were not that a naive observation of these subjects produces little evidence of purposeful behavior.

Hypothesis number three was accepted in some cases

and rejected in others, indicating that significant differences exist between some, but not all, of the individual subjects' mean distancing behavior.

Conclusions

Subjects who had shown no significant differences in adaptive behavior, as measured by an adaptive behavior scale, exhibited significant differences in proxemic behavior. Not only did individual differences become apparent, but also reliably measureable proxemic patterns emerged for the group. The subjects developed a sort of "hierarchy" of relative isolation or intimacy with respect to the group as a whole. Proxemic measurement has shown that all the distancing behaviors in question differed significantly from a chance model.

Perhaps the most significant aspect of this study is the discovery of reliably measureable behavior that is not apparent until refined and specific measuring techniques are applied to the task of observation. That the behaviors being measured by this technique may be crucial elements in the process of human interaction makes the promise of this approach doubly exciting.

The possible future applications of proxemic research are manifold. The integration into society of institutionalized individuals, such as the subjects in this study, may be aided greatly. This research suggests that it may be possible to make accurate and reliable

proxemic measurements of an individual's behavior and at the same time know the proxemic patterns that are acceptable in the community into which he is to be placed. With such information available teaching programs designed to enhance the adaptability of the individual could be effected.

The effect of our fixed-feature space may be critical to many issues concerning urban planning. More and more the design of our cities will need to take into consideration the proxemic needs peculiar to the subcultures within society. Levels of mass anxiety, hostilities, etc., may be partially determined by the nature of the space that is arranged for people.

The Paris peace talks begun in 1967 among the combatants in the Viet Nam conflict provided another interesting area for proxemic study. A great deal of time was spent discussing various proposals for the seating arrangements of the participants prior to the beginning of peace talks. Each delegation presented its own proposal for the shape of the conference table and seating arrangement. It was interesting to speculate about the possible relationships between the decision to use a circular table and seating arrangement and the psychiatric studies of circular versus rectangular seating arrangement in group therapy that were cited in this study.[44]

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[44] Supra, Winick and Holt, p. 19.

Proxemic analysis should be quite productively applied in the variousfields of education. For example, the studies of the effect of various levels of anxiety and its effect on learning could be applied in the design of the use of space in the learning situation. Many of the various classroom situations found today may be differentiated quite adequately by proxemic measurement alone. How these various proxemic patterns relate to the learning behavior of the members of various subcultures should be a very fruitful and practical area of research.

Recommendations

With respect to the specific area of concern of the present study, further research is suggested along two lines. The first suggestion is to expand the number of parameters of proxemic behavior measured. Proxemic behavior is a multi-dimensional concept - this study applied measurement only to one dimension. Hall's eight measurements of proxemic behavior provides a set of dimensions whose measurements are amenable to data processing operations. This, of course, would make the data collection and processing possible for much larger numbers of subjects.

The second recommendation would be to apply multi-dimensional proxemic measurements to the specific commu-

nities into which mentally retarded children are hopefully to be integrated. Then the practical application of teaching necessary proxemic behavior patterns could begin.

The following recommendation is made for further research outside the immediate area of the present study. It is suggested that a cross-cultural proxemic study of the American and Vietnamese cultures be made. The transcript of the seating arrangement negotiations in Paris would be an integral part of such a study.

APPENDICES

APPENDIX A

TABLE IV

INDIVIDUAL AND MEAN DISTANCES INCLUDING RANK VALUE OF MEAN DISTANCE FOR SUBJECT NUMBER ONE

	Distance in feet				
Observation	S1-S2	S1-S3	S1-S4	Mean Distance	Rank Mean Distance *
1	9	12	6	9.00	3
2	8	15	6	9.67	4
3	5	7	12	8.00	3
4	6	8	10	8.00	4
5	8	14	17	13.00	3
6	4	13	15	10.67	3
7	8	4	18	10.00	3.5
8	6	16	16	12.67	3
9	11	15	14	13.30	2.5
10	7	10	8	8.30	2
11	6	6	6	6.00	3.5
12	4	7	8	6.30	2
13	4	6	8	6.00	3.5
14	15	10	10	11.67	1
15	15	7	5	9.00	2
16	15	8	8	10.30	2
17	16	5	4	8.30	2
18	6	4	4	4.67	4
19	17	7	9	11.00	2
20	16	8	9	11.00	1
21	15	15	16	15.30	1
22	24	15	16	18.30	1
23	17	11	12	13.30	1
24	22	19	21	20.67	1
25	12	19	20	17.00	1
26	11	17	18	5.30	4
27	14	18	19	17.00	1
28	5	18	20	14.30	1
29	24	16	16	18.67	1
30	18	7	9	11.30	2
31	16	11	12	13.00	2
32	16	15	20	17.00	1
33	17	17	20	18.00	1
34	11	16	14	13.67	1
35	24	10	11	15.00	2

TABLE IV CONT.

Observation	Distance in feet S1-S2	S1-S3	S1-S4	Mean Distance	Rank Mean Distance *
36	22	15	15	17.67	1
37	16	7	7	9.67	2
38	24	20	20	20.67	1
39	18	13	13	13.67	1
40	16	18	18	17.00	1
41	16	19	19	17.67	1
42	17	12	14	14.30	2
43	14	16	14	14.67	1
44	8	15	16	13.00	1
45	11	10	12	11.00	2
46	16	19	20	18.30	1
47	19	4	3	8.67	2
48	15	1	1	5.67	2.5
49	6	22	23	17.00	1
50	11	18	20	16.30	2
51	24	18	17	19.67	1
52	15	18	21	18.00	1
53	8	14	16	12.67	1
54	10	8	7	8.30	1
55	16	1	1	6.00	2.5
56	17	3	1	7.00	2
57	12	21	20	17.67	1
58	10	16	16	14.00	1
59	26	14	13	17.67	1
60	13	21	21	18.30	1
61	24	15	15	18.00	1
62	15	14	15	14.67	1
63	15	16	15	15.30	1
64	12	10	11	11.00	2
65	11	15	14	13.30	1
66	11	12	12	11.67	1.5
67	11	7	8	8.67	4
68	20	5	6	10.30	2
69	16	5	4	8.30	2
70	7	6	8	7.00	2.5
71	13	7	9	9.67	2
72	14	6	7	9.00	2
73	7	9	10	8.67	2
74	12	5	5	7.30	2
75	14	13	13	13.30	1

TABLE IV CONT.

Observation	Distance in feet S1-S2	S1-S3	S1-S4	Mean Distance	Rank Mean Distance *
76	18	13	14	15.00	1
77	4	6	7	5.67	1
78	12	9	10	10.30	4
79	16	9	9	11.30	1
80	7	7	7	7.00	1
81	5	5	7	5.67	1
82	14	4	4	7.30	2
83	14	4	6	8.00	2
84	11	7	7	8.30	2
85	11	8	8	9.00	1
86	10	8	8	8.67	1
87	11	19	19	16.30	1
88	10	11	11	10.67	1

* Decimal fractions indicate tied pairs.

APPENDIX B

TABLE V

INDIVIDUAL AND MEAN DISTANCES INCLUDING RANK VALUE OF MEAN DISTANCE FOR SUBJECT NUMBER TWO

Observation	Distance in feet S2-S1	S2-S3	S2-S4	Mean Distance	Rank Mean Distance *
1	9	2	15	8.67	4
2	8	8	15	10.30	3
3	5	3	15	7.67	4
4	6	9	10	8.30	3
5	8	12	11	10.30	4
6	4	13	11	9.30	4
7	8	12	10	10.00	3.5
8	6	16	16	12.67	3
9	11	15	14	13.30	2.5
10	7	10	8	8.30	2
11	6	6	6	6.00	3.5
12	4	7	8	6.30	2
13	4	6	8	6.00	3.5
14	15	9	8	10.67	2
15	15	13	12	13.30	1
16	15	10	11	12.00	1
17	16	13	13	14.00	1
18	6	10	9	8.30	1
19	17	11	9	12.30	1
20	16	8	8	10.67	2
21	15	6	5	8.67	2
22	24	15	14	17.67	2
23	17	10	9	12.00	2
24	22	14	14	16.67	2
25	12	7	8	9.00	2.5
26	11	6	8	8.30	2
27	14	9	10	11.00	2
28	5	13	14	10.67	3.5
29	24	13	15	17.30	2
30	18	11	9	12.67	1
31	16	16	18	16.67	1
32	;6	11	4	10.30	4
33	17	4	3	8.00	4
34	11	5	4	6.67	3.5
35	24	15	16	18.30	1

TABLE V CONT.

Observation	Distance in feet S2-S1	S2-S3	S2-S4	Mean Distance	Rank Mean Distance *
36	22	11	12	15.00	2
37	16	10	8	11.30	1
38	24	14	14	17.30	2
39	18	8	6	10.67	2
40	16	16	17	16.30	2
41	16	16	17	16.30	2
42	17	13	14	14.67	1
43	14	4	4	7.30	2.5
44	8	10	12	6.30	4
45	11	11	12	11.30	1
46	16	12	13	13.67	2
47	19	16	16	17.00	1
48	15	15	14	14.67	1
49	6	15	16	12.30	4
50	11	21	22	18.00	1
51	24	6	7	12.30	2
52	15	3	5	7.67	3.5
53	8	9	9	8.67	2.5
54	10	6	6	7.30	2
55	16	16	15	15.67	1
56	17	14	15	15.30	1
57	12	9	8	9.67	3.5
58	10	6	7	7.67	3.5
59	26	9	9	14.67	2
60	13	10	11	11.30	2
61	24	9	8	13.67	2
62	15	6	7	9.30	2
63	15	2	1	6.00	3
64	12	14	14	13.00	1
65	11	10	10	10.30	2
66	11	12	12	11.67	1.5
67	11	19	20	16.67	1
68	20	19	20	19.67	1
69	16	13	12	13.67	1
70	7	11	12	10.00	1
71	13	17	18	16.00	1
72	14	16	17	15.67	1
73	7	11	12	10.00	1
74	12	8	8	9.30	1
75	14	10	12	12.00	2

TABLE V CONT.

Observation	Distance in feet S2-S1	S2-S3	S2-S4	Mean Distance	Rank Mean Distance *
76	18	10	10	12.67	2
77	4	2	2	2.67	4
78	12	14	14	13.30	1
79	16	6	7	9.67	2
80	7	6	4	5.67	2
81	5	4	5	4.67	2
82	14	10	11	11.67	1
83	14	4	6	8.00	2
84	11	7	8	8.67	1
85	11	8	7	8.67	2
86	10	2	3	5.00	2
87	11	7	8	8.67	4
88	10	9	10	9.67	2

* Decimal fractions indicate tied pairs.

APPENDIX C

TABLE VI

INDIVIDUAL AND MEAN DISTANCES INCLUDING RANK VALUE OF MEAN DISTANCE FOR SUBJECT NUMBER THREE

Observation	S3-S1	S3-S2	S3-S4	Mean Distance	Rank Mean Distance *
1	12	2	17	10.30	2
2	15	8	22	15.00	1
3	7	3	18	9.30	2
4	8	9	18	11.67	2
5	14	12	22	16.00	2
6	13	13	18	14.67	1.5
7	4	12	22	12.67	2
8	16	15	16	15.67	1
9	15	9	16	13.30	2.5
10	10	12	1	7.67	3
11	6	6	6	6.00	3.5
12	7	5	5	5.67	3.5
13	6	10	2	6.00	3.5
14	10	9	1	6.67	3
15	7	13	2	7.30	3
16	8	10	2	6.67	4
17	5	13	1	6.30	3
18	4	10	2	5.30	2
19	7	11	1	6.60	3.5
20	8	8	1	5.67	4
21	15	6	1	7.30	3.5
22	15	15	1	10.30	3.5
23	11	10	1	7.30	3.5
24	19	14	1	11.30	4
25	19	7	1	9.00	3.5
26	17	6	1	8.00	3
27	18	9	1	9.30	4
28	18	13	1	10.67	3.5
29	16	13	1	10.00	4
30	7	11	1	6.30	3.5
31	11	16	2	9.67	4
32	15	11	13	13.00	2
33	17	4	4	8.30	3
34	16	5	2	7.67	2
35	10	15	1	8.67	4

TABLE VI CONT.

Observation	S3-S1	S3-S2	S3-S4	Mean Distance	Rank Mean Distance *
36	16	11	1	9.30	3.5
37	6	10	2	6.00	3
38	18	14	1	11.00	4
39	10	8	2	6.67	4
40	17	16	1	11.30	4
41	18	16	1	11.67	4
42	12	13	1	8.67	4
43	16	4	2	7.30	2.5
44	15	10	1	8.67	3
45	10	11	2	7.67	4
46	19	12	1	10.67	4
47	4	16	1	7.00	3
48	1	15	1	5.67	2.5
49	22	15	1	12.67	3
50	18	21	2	13.67	4
51	18	6	1	8.30	3.5
52	18	3	2	7.67	3.5
53	14	9	1	8.00	3
54	8	6	1	5.00	3
55	1	16	1	6.00	2.5
56	3	14	1	6.00	3
57	21	9	1	10.30	2
58	16	6	1	7.67	3.5
59	14	9	1	8.00	3
60	21	10	1	10.67	4
61	15	9	1	8.30	3
62	14	6	1	7.00	4
63	16	2	1	6.30	2
64	10	14	1	8.30	4
65	15	10	1	8.67	3
66	12	12	1	8.30	2.5
67	7	19	1	9.00	3
68	5	19	1	8.30	4
69	5	13	1	6.30	3
70	6	11	1	6.00	3
71	7	17	1	8.30	4
72	6	16	1	7.67	4
73	9	11	1	7.00	4
74	5	8	1	4.67	3.5
75	13	10	1	8.00	4

TABLE VI CONT.

Observation	S3-S1	S3-S2	S3-S4	Mean Distance	Rank Mean Distance *
76	13	10	1	8.00	4
77	6	2	1	3.00	3
78	9	14	12	11.67	3
79	9	6	1	5.30	4
80	7	6	2	5.00	3
81	5	4	1	3.30	4
82	4	10	1	5.00	4
83	4	14	1	6.30	4
84	7	7	1	5.00	4
85	8	8	1	5.67	3
86	8	2	1	3.67	4
87	19	7	1	9.00	3
88	11	9	1	7.00	4

* Decimal fractions indicate tied pairs.

APPENDIX D

TABLE VII

INDIVIDUAL AND MEAN DISTANCES INCLUDING RANK VALUE OF MEAN DISTANCE FOR SUBJECT NUMBER FOUR

	Distance in feet				
Observation	S4-S1	S4-S2	S4-S3	Mean Distance	Rank Mean Distance *
1	6	15	17	12.67	1
2	6	15	22	14.30	2
3	12	15	18	15.00	1
4	10	10	18	12.67	1
5	17	11	22	16.67	1
6	15	11	18	14.67	1.5
7	18	10	22	16.67	1
8	16	10	16	14.00	2
9	14	11	16	13.67	1
10	8	13	1	7.30	4
11	6	11	6	7.67	1.5
12	8	8	5	7.00	1
13	8	12	2	7.30	2
14	10	8	1	6.30	4
15	5	12	2	6.30	4
16	8	11	2	7.00	3
17	4	13	1	6.00	4
18	4	9	2	5.00	3
19	9	9	1	6.30	3.5
20	9	8	1	6.00	3
21	16	5	1	7.30	3.5
22	16	14	1	10.30	3.5
23	12	9	1	7.30	3.5
24	21	14	1	12.00	3
25	20	8	1	9.67	2
26	18	8	1	9.00	1
27	19	10	1	10.00	3
28	20	14	1	11.67	2
29	16	15	1	10.67	3
30	9	9	1	6.30	3.5
31	12	18	2	10.67	3
32	20	4	13	12.30	3
33	20	3	4	9.00	2
34	14	4	2	6.67	3.5
35	11	16	1	9.30	3

TABLE VII CONT.

Observation	S4-S1	S4-S2	S4-S3	Mean Distance	Rank Mean Distance *
36	15	12	1	9.30	3.5
37	7	8	2	5.67	4
38	20	14	1	11.67	3
39	13	6	2	7.00	3
40	18	17	1	12.00	3
41	19	17	1	12.30	3
42	14	14	1	9.67	3
43	14	4	2	6.67	3
44	16	12	1	9.67	2
45	12	12	2	8.67	3
46	20	13	1	11.30	3
47	3	16	1	6.67	4
48	1	14	1	5.30	3
49	23	16	1	13.30	2
50	20	22	2	14.67	3
51	17	7	1	8.30	3.5
52	21	5	2	9.30	2
53	16	9	1	8.67	2.5
54	7	6	1	4.67	4
55	1	15	1	5.67	3
56	1	15	1	5.67	4
57	20	8	1	9.67	3.5
58	16	7	1	8.00	2
59	13	9	1	7.67	4
60	21	11	1	11.00	3
61	15	8	1	8.00	4
62	15	7	1	7.67	3
63	15	1	1	5.67	4
64	11	14	1	8.67	3
65	14	10	1	8.30	4
66	12	12	1	8.30	2.5
67	8	20	1	9.67	2
68	6	20	1	9.00	3
69	4	12	1	5.67	4
70	8	12	1	7.00	2.5
71	9	18	1	9.30	3
72	7	17	1	8.30	3
73	10	12	1	7.67	3
74	5	8	1	4.67	3.5
75	13	12	1	8.67	3

TABLE VII CONT.

Observation	S4-S1	S4-S2	S4-S3	Mean Distance	Rank Mean Distance *
76	14	10	1	8.30	3
77	7	2	1	3.30	2
78	10	14	12	12.00	2
79	9	7	1	5.67	3
80	7	4	2	4.30	4
81	7	5	1	4.30	3
82	4	11	1	5.30	3
83	6	14	1	7.00	3
84	7	8	1	5.30	1
85	8	7	1	5.30	4
86	8	3	1	4.00	3
87	19	8	1	9.30	2
88	11	10	1	9.30	3

* Decimal fractions indicate tied pairs

APPENDIX E

TABLE VIII

NORMALIZATION OF DISTANCE MEASUREMENT FREQUENCIES FOR SUBJECT NUMBER ONE

D	f_o	Upper Limit	x	z	Proportion Below	Proportion Within	f_e
1	5	1.5	10.7	1.97	.9756	.0157	4.14
2	0	2.5	9.7	1.75	.9599	.0158	4.17
3	2	3.5	8.7	1.59	.9441	.0249	6.67
4	13	4.5	7.7	1.40	.9192	.0304	7.03
5	10	5.5	6.7	1.22	.8888	.0380	10.03
6	16	6.5	5.7	1.04	.8508	.0485	12.80
7	20	7.5	4.7	.85	.8023	.0537	14.18
8	19	8.5	3.7	.67	.7486	.0714	18.85
9	9	9.5	2.7	.46	.6772	.0555	14.65
10	14	10.5	1.7	.31	.6217	.0739	19.51
11	17	11.5	.7	.12	.5478	.0677	17.87
12	13	12.5	- .3	-.05	.4801	.0711	18.77
13	8	13.5	-1.3	-.23	.4090	.0718	18.95
14	16	14.5	-2.3	-.42	.3372	.0629	16.61
15	21	15.6	-3.3	-.60	.2743	.0566	14.94
16	25	16.5	-4.3	-.78	.2177	.0566	14.94
17	10	17.5	-5.3	-.99	.1611	.0360	9.50
18	13	18.5	-6.3	-1.15	.1251	.0333	8.79
19	8	19.5	-7.3	-1.33	.0918	.0263	6.94
20	9	20.5	-8.3	-1.51	.0655	.0200	5.28
21	5	21.5	-9.3	-1.69	.0455	.0168	4.43
22	3	22.5	-10.3	-1.90	.0287	.0090	2.38
23	1	23.5	-11.3	-2.06	.0197	.0072	1.90
24	6	24.5	-12.3	-2.24	.0125	.0050	1.32
25	0	25.5	-13.3	-2.43	.0075	.0030	.79
26	1	26.6	-14.3	-2.61	.0045	.0045	1.19

APPENDIX F

TABLE IX

CHI SQUARE TEST FOR GOODNESS OF FIT
TO z DISTRIBUTION FOR DISTANCE MEASUREMENTS

Subject Number One

D	f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
1	5	4.14	.86	.74	.18
2	0	4.17	4.17	17.39	4.17
3	2	6.67	4.67	21.81	3.27
4	13	7.03	6.03	36.36	5.17
5	10	10.03	.03	.00	.00
6	16	12.80	3.20	10.24	.80
7	20	14.18	5.82	33.87	2.39
8	19	18.85	.15	.02	.00
9	9	14.65	5.65	31.92	2.18
10	14	19.51	5.51	30.36	1.56
11	17	17.87	.87	.76	.04
12	13	18.77	5.77	33.29	1.77
13	8	18.95	10.95	119.90	6.33
14	16	16.61	.61	.37	.02
15	21	14.94	6.06	36.72	2.46
16	25	14.94	10.06	101.20	6.77
17	10	9.50	.50	.25	.03
18	13	8.79	4.21	17.72	2.01
19	8	6.94	1.06	1.12	.16
20	9	5.28	3.72	13.84	2.62
21	5	4.43	.57	.32	.07
22	3	2.38	.62	.38	.16
23	1	1.90	.90	.81	.43
24	6	1.32	4.68	21.90	16.59
25	0	.79	.79	.62	.78
26	1	1.19	.19	.04	.04
					$x^2 = 60.00$

APPENDIX G

TABLE X

NORMALIZATION OF DISTANCE MEASUREMENT FREQUENCIES FOR SUBJECT NUMBER TWO

D	f_o	Upper Limit	x	z	Proportion Below	Proportion Within	f_e
1	0	1.5	9.9	2.06	.9803	.0125	3.30
2	4	2.5	8.9	1.85	.9678	.0183	4.83
3	4	3.5	7.9	1.64	.9495	.0259	6.84
4	10	4.5	6.9	1.43	.9236	.0348	9.19
5	8	5.5	5.9	1.22	.8888	.0427	11.27
6	16	6.5	4.9	1.02	.8461	.0551	14.55
7	12	7.5	3.9	.81	.7910	.0653	17.24
8	20	8.5	2.9	.60	.7257	.0740	19.54
9	14	9.5	1.9	.39	.6517	.0803	21.20
10	22	10.5	.9	.18	.5714	.0784	20.96
11	25	11.5	.1	-.02	.4920	.0791	20.88
12	18	12.5	-1.1	-.22	.4129	.0793	20.94
13	12	13.5	-2.1	-.43	.3336	.0725	19.14
14	21	14.5	-3.1	-.64	.2611	.0634	16.74
15	19	15.5	-4.1	-.85	.1977	.0531	14.02
16	19	16.5	-5.1	-1.06	.1446	.0426	11.25
17	9	17.5	-6.1	-1.27	.0120	.0212	5.60
18	5	18.5	-7.1	-1.47	.0708	.0243	6.41
19	3	19.5	-8.1	-1.68	.0465	.0171	4.51
20	3	20.5	-9.1	-1.89	.0294	.0115	3.04
21	1	21.5	-10.1	-2.10	.0179	.0075	1.98
22	3	22.5	-11.1	-2.31	.0104	.0045	1.19
23	0	23.5	-12.1	-2.52	.0059	.0026	.69
24	6	24.5	-13.1	-2.72	.0033	.0016	.42
25	0	25.5	-14.1	-2.93	.0017	.0009	.24
26	0	26.5	-15.1	-3.14	.0008	.0008	.21

APPENDIX H

TABLE XI

CHI SQUARE TEST FOR GOODNESS OF FIT
TO z DISTRIBUTION FOR DISTANCE MEASUREMENTS

Subject Number Two

D	f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
1	0	3.30	3.30	10.89	3.30
2	4	4.83	- .83	.69	.14
3	4	6.84	2.84	8.07	1.18
4	10	9.19	.81	.66	.07
5	8	11.27	3.27	10.69	.95
6	16	14.55	1.45	2.10	.14
7	12	17.24	5.24	27.46	1.59
8	20	19.54	.46	.21	.01
9	14	21.20	7.20	51.84	2.45
10	22	20.96	1.04	1.08	.05
11	25	20.88	4.12	16.97	.81
12	18	20.94	2.94	8.64	.41
13	12	19.14	7.14	50.98	2.66
14	21	16.74	4.26	18.15	1.08
15	19	14.02	4.98	24.80	1.77
16	19	11.25	7.75	60.06	5.34
17	9	5.60	3.40	11.56	2.06
18	5	6.41	1.41	1.99	.31
19	3	4.51	1.51	2.28	.50
20	3	3.04	.04	.00	.00
21	1	1.98	.98	.96	.48
22	3	1.19	1.81	3.28	2.76
23	0	.69	.69	.48	.70
24	6	.42	5.13	26.32	30.25
25	0	.24	.24	.06	.25
26	0	.21	.21	.04	.19

$x^2 = 59.45$

APPENDIX I

TABLE XII

NORMALIZATION OF DISTANCE MEASUREMENT FREQUENCIES FOR SUBJECT NUMBER THREE

D	f_o	Upper Limit	x	z	Proportion Below	Proportion Within	f_e
1	63	1.5	6.8	.65	.7422	.0334	8.82
2	17	2.5	5.8	.55	.7088	.0316	8.33
3	3	3.5	4.8	.46	.6772	.0366	9.66
4	9	4.5	3.8	.36	.6406	.0380	10.03
5	8	5.5	2.8	.26	.6026	.0390	10.30
6	16	6.5	1.8	.17	.5636	.0357	9.42
7	12	7.5	.8	.07	.5279	.0359	9.48
8	11	8.5	-.2	-.02	.4920	.0358	9.45
9	12	9.5	-1.2	-.11	.4562	.0394	10.31
10	17	10.5	-2.2	-.21	.4168	.0385	10.16
11	10	11.5	-3.2	-.31	.3783	.0337	8.90
12	9	12.5	-4.2	-.40	.3446	.0361	9.53
13	11	13.5	-5.2	-.50	.3085	.0309	8.16
14	10	14.5	-6.2	-.59	.2776	.0325	8.58
15	13	15.5	-7.2	-.69	.2451	.0274	7.23
16	15	16.5	-8.2	-.78	.2177	.0263	6.94
17	5	17.5	-9.2	-.88	.1894	.0234	6.18
18	10	18.5	-10.2	-.97	.1660	.0237	6.26
19	6	19.5	-11.2	-1.07	.1423	.0193	5.09
20	0	20.5	-12.2	-1.16	.1230	.0155	4.09
21	3	21.5	-13.2	-1.26	.1075	.0206	5.44
22	4	22.5	-14.2	-1.36	.0869	.0134	3.54
23	0	23.5	-15.2	-1.45	.0735	.0129	3.41
24	0	24.5	-16.2	-1.55	.0606	.0101	2.67
25	0	25.5	-17.2	-1.64	.0505	.0096	2.53
26	0	26.5	-18.2	-1.74	.0409	.0409	10.80

APPENDIX J

TABLE XIII

CHI SQUARE TEST FOR GOODNESS OF FIT
TO z DISTRIBUTION FOR DISTANCE MEASUREMENTS

Subject Number Three

D	f_o	f_e	$(f_o-f_e)^2$	$\frac{(f_o-f_e)^2}{f_e}$
1	63	8.82	2935.47	332.82
2	17	8.33	75.17	9.02
3	3	9.66	44.36	4.59
4	9	10.03	1.06	.11
5	8	10.30	5.29	.51
6	16	9.42	43.30	4.60
7	12	9.48	6.35	.67
8	11	9.45	2.40	.25
9	12	10.31	2.86	.28
10	17	10.16	46.79	4.60
11	10	8.90	1.21	.14
12	9	9.53	.28	.03
13	11	8.16	8.07	.99
14	10	8.58	2.02	.23
15	13	7.23	33.29	4.60
16	15	6.94	64.96	9.36
17	5	6.18	1.39	.22
18	10	6.26	13.99	2.23
19	6	5.09	.83	.16
20	0	4.09	16.73	4.09
21	3	5.44	5.95	1.09
22	4	3.54	.21	.06
23	0	3.41	11.63	3.41
24	0	2.67	7.13	2.67
25	0	2.53	6.40	2.53
26	0	10.80	116.64	10.80
				$x^2=400.06$

APPENDIX K

TABLE XIV

NORMALIZATION OF DISTANCE MEASUREMENT FREQUENCIES FOR SUBJECT NUMBER FOUR

D	f_o	Upper Limit	x	z	Proportion Below	Proportion Within	f_e
1	65	1.5	7.6	.78	.7823	.0306	8.08
2	14	2.5	6.6	.68	.7517	.0745	19.67
3	3	3.5	5.6	.57	.7157	.0385	10.16
4	9	4.5	4.6	.46	.6772	.0329	8.67
5	6	5.5	3.6	.37	.6443	.0379	10.01
6	8	6.5	2.6	.27	.6064	.0428	11.30
7	12	7.5	1.6	.16	.5636	.0397	10.48
8	19	8.5	.6	.06	.5239	.0399	10.53
9	11	9.5	-.4	-.04	.4840	.0397	10.48
10	11	10.5	-1.4	-.14	.4443	.0430	11.35
11	10	11.5	-2.4	-.25	.4013	.0381	10.06
12	16	12.5	-3.4	-.35	.3632	.0368	9.71
13	7	13.5	-4.4	-.45	.3264	.0352	9.29
14	15	14.5	-5.4	-.55	.2912	.0366	9.66
15	11	15.5	-6.4	-.66	.2546	.0310	8.18
16	12	16.5	-7.4	-.76	.2236	.0287	7.58
17	6	17.5	-8.4	-.86	.1949	.0264	6.97
18	8	18.5	-9.4	-.96	.1685	.0262	6.92
19	3	19.5	-10.4	-1.07	.1423	.0213	5.62
20	10	20.5	-11.4	-1.17	.1210	.0190	5.02
21	3	21.5	-12.4	-1.27	.1020	.0167	4.41
22	4	22.5	-13.4	-1.37	.0853	.0159	4.20
23	1	23.5	-14.4	-1.48	.0694	.0123	3.25
24	0	24.5	-15.4	-1.58	.0571	.0106	2.80
25	0	25.5	-16.4	-1.68	.0465	.0090	2.38
26	0	26.5	-17.4	-1.78	.0375	.0375	9.90

APPENDIX L

TABLE XV

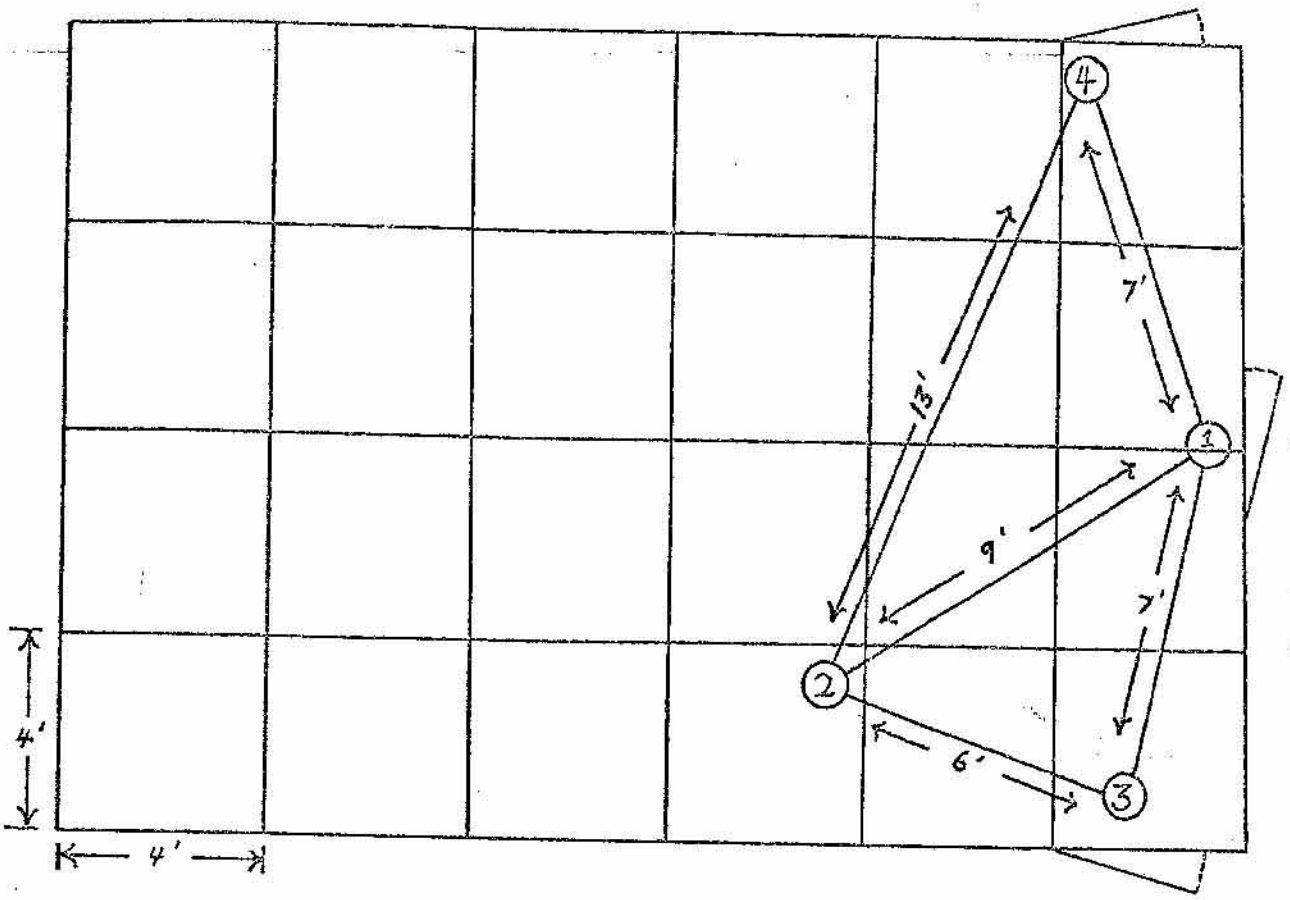
CHI SQUARE TEST FOR GOODNESS OF FIT
TO z DISTRIBUTION FOR DISTANCE MEASUREMENTS

Subject Number Four

D	f_o	f_e	f_o-f_e	$(f_o-f_e)^2$	$\frac{(f_o-f_e)^2}{f_e}$
1	65	8.08	56.92	3239.89	400.98
2	14	19.67	5.67	32.15	1.63
3	3	10.16	7.16	51.27	5.05
4	9	8.67	.33	.11	.01
5	6	10.01	4.01	16.08	1.61
6	8	11.30	3.30	10.89	.96
7	12	10.48	1.52	2.31	.22
8	19	10.53	8.47	71.74	6.81
9	11	10.48	.52	.27	.03
10	11	11.35	.35	.12	.01
11	10	10.06	.06	.00	.00
12	16	9.71	6.29	39.56	4.07
13	7	9.29	2.29	5.24	.56
14	15	9.66	5.34	28.52	3.95
15	11	8.18	2.82	7.95	.97
16	12	7.58	4.42	19.54	2.58
17	6	6.97	.97	.94	.13
18	8	6.92	1.08	1.17	.17
19	3	5.62	2.67	6.86	1.22
20	10	5.02	4.98	24.80	4.94
21	3	4.41	1.41	1.99	.45
22	4	4.20	.20	.04	.01
23	1	3.25	2.25	5.06	1.56
24	0	2.80	2.80	7.84	2.80
25	0	2.38	2.38	5.66	2.38
26	0	9.90	9.90	98.01	9.90
					$x^2=453.00$

APPENDIX M

FIGURE 1 - DATA RECORDING SHEET



Number 1 Time 00.0 min.

S_3	Distance	Av. Dist.	Group Av.
$S_1 - S_2$	9'		9.3'
$S_1 - S_3$	7'		
$S_1 - S_4$	7'		
23'/3 =		7.6'	
$S_2 - S_1$	9'		
$S_2 - S_3$	6'		
$S_2 - S_4$	13'		
28'/3 =		9.3'	
$S_3 - S_1$	7'		
$S_3 - S_2$	6'		
$S_3 - S_4$	14'		
27'/3 =		9.0'	
$S_4 - S_1$	7'		
$S_4 - S_2$	13'		
$S_4 - S_3$	14'		
34'/3 =		11.3'	

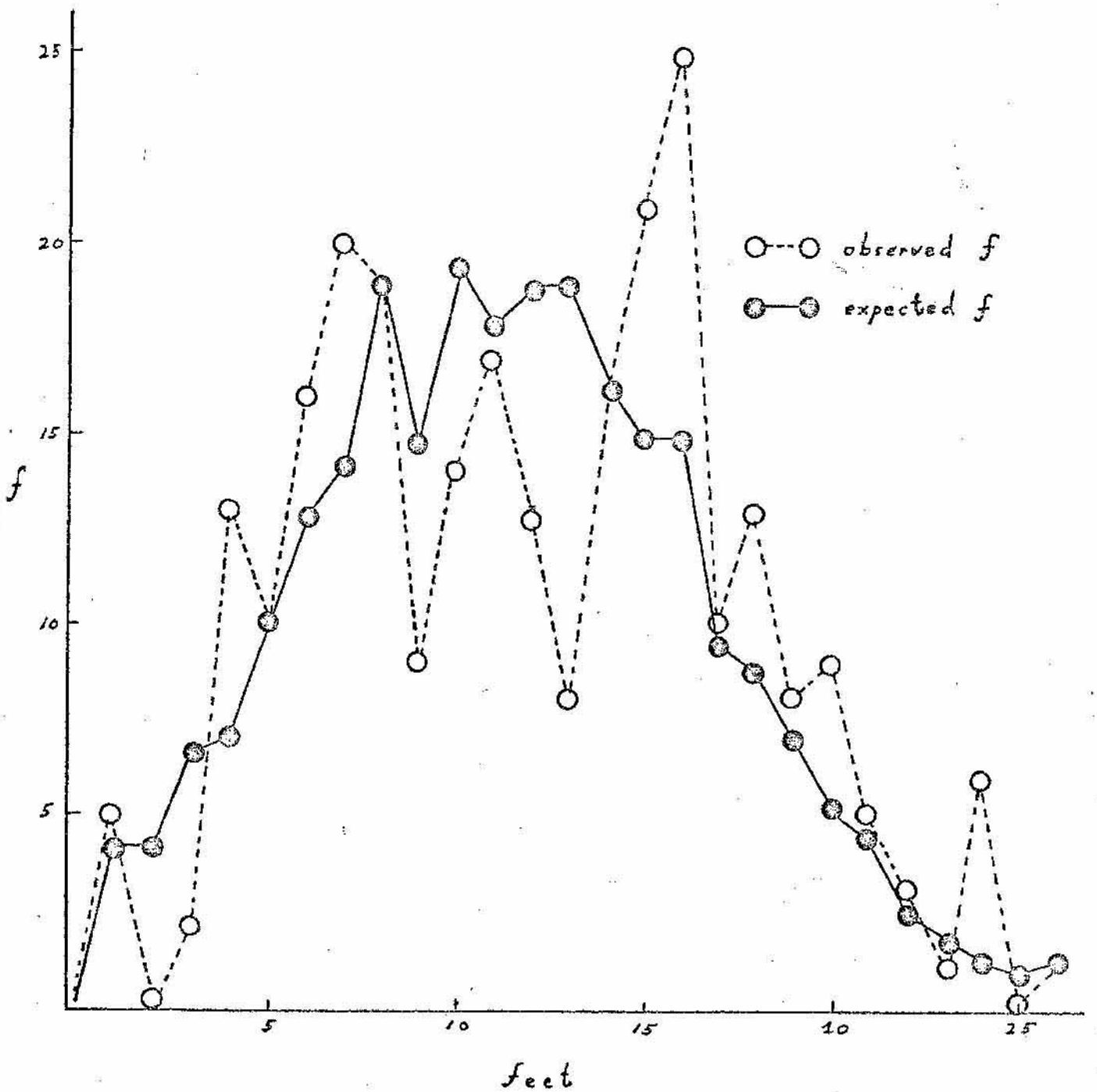
Notes

Subjects — 1, 2, 3, 4

APPENDIX N

FIGURE 2

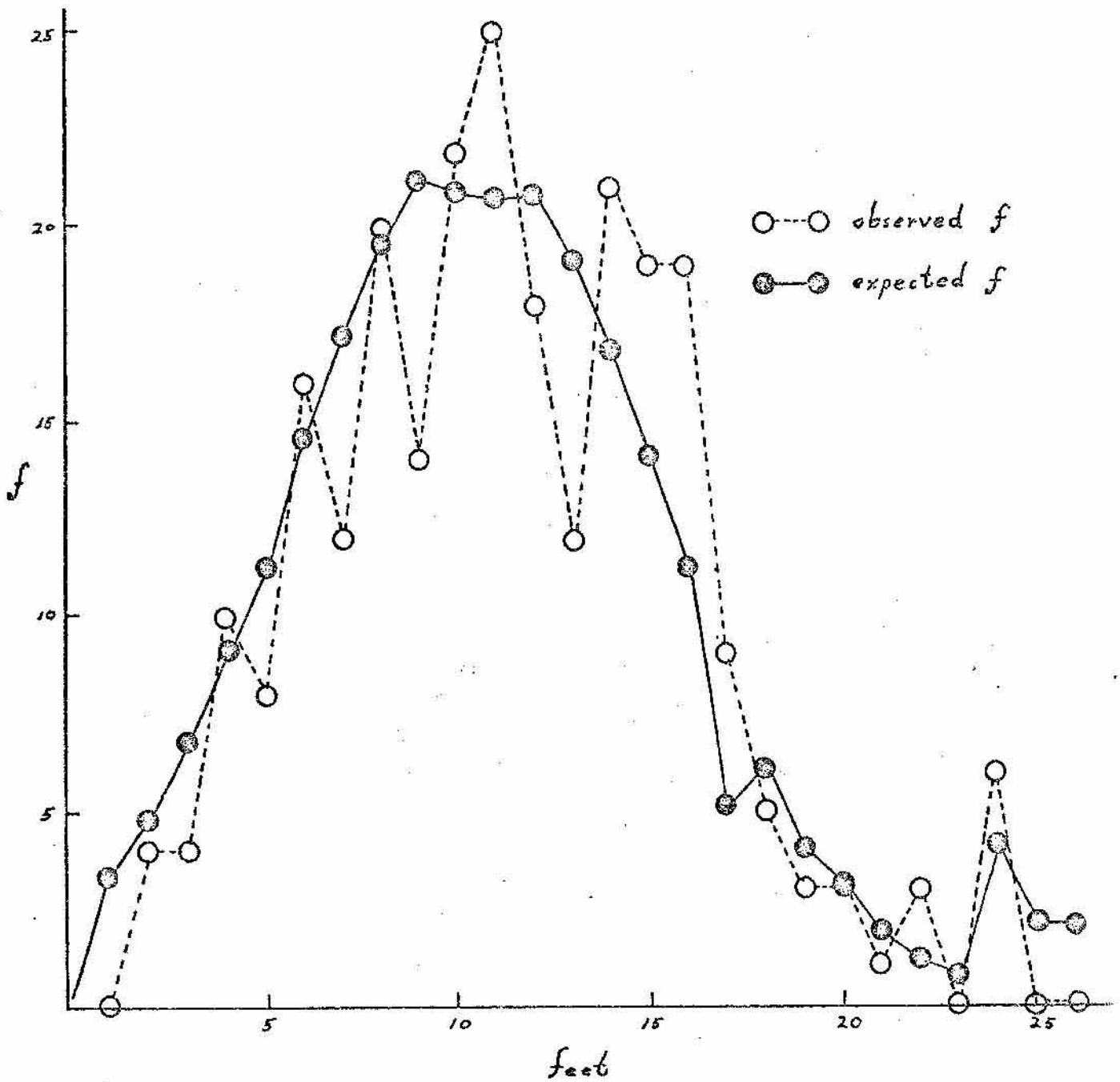
OBSERVED AND EXPECTED FREQUENCY OF DISTANCING BEHAVIOR OF SUBJECT NUMBER ONE



APPENDIX O

FIGURE 3

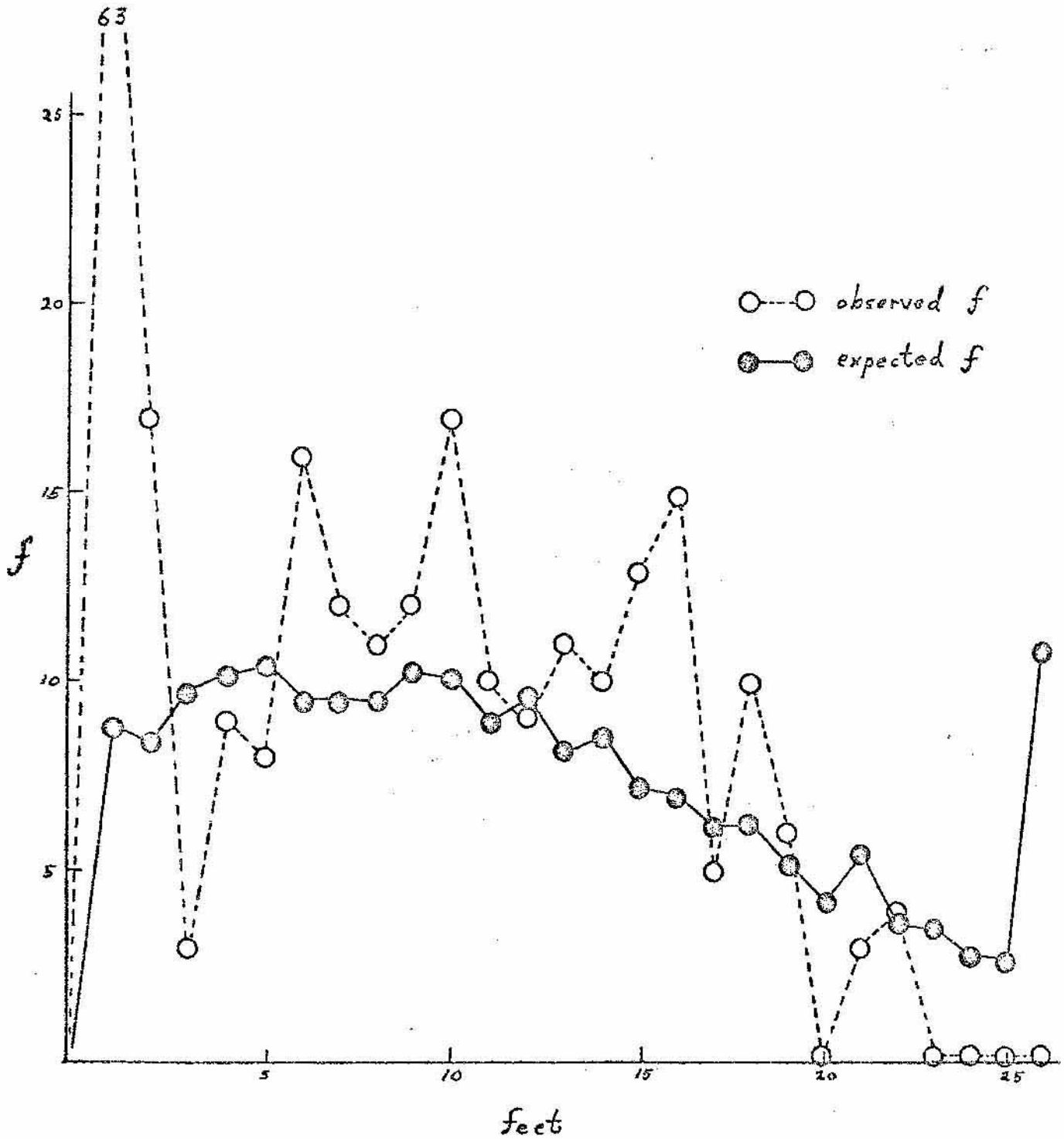
OBSERVED AND EXPECTED FREQUENCY OF DISTANCING BEHAVIOR OF SUBJECT NUMBER TWO



APPENDIX P

FIGURE 4

OBSERVED AND EXPECTED FREQUENCY OF DISTANCING BEHAVIOR OF SUBJECT NUMBER THREE



APPENDIX Q

FIGURE 5

OBSERVED AND EXPECTED FREQUENCY OF DISTANCING BEHAVIOR OF SUBJECT NUMBER FOUR

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