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To the Graduate Council:

I am submitting herewith a dissertation written by Mark H. Richman entitled "The Effects of Space and Acquaintance on the Social Behaviors of Pre-School Children During Free-Play." I recommend that it be accepted in partial fulfillment for the degree of Doctor of Philosophy with a major in Psychology.

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THE EFFECTS OF SPACE AND ACQUAINTANCE ON THE SOCIAL BEHAVIORS OF PRE-SCHOOL CHILDREN DURING FREE-PLAY

A Dissertation

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

---

by

Mark H. Richman

December 1974

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ABSTRACT

This study examined the effects of degree of acquaintance and high and low spatial density conditions on the frequencies of a number of social behaviors evidenced by pre-school children during free-play. Videotape recordings were made of the free-play of two groups of four year olds; one, a group of eleven well-acquainted children, and the second, a newly-formed group of nine children most of whom were strangers to one another. Each of the groups was observed during several thirty-minute play periods under low, high, and then low spatial density conditions.

Results indicated that agonistic motor patterns increased and non-agonistic behaviors decreased in high density conditions for the well-established group. There were few significant differences in social behavior due to density for the newly-formed group. The results further showed that strangers were more agonistic toward one another than were friends, regardless of density conditions. There were also significant main effects of sex on agonistic and rough and tumble play behaviors--males exhibiting higher frequencies of both categories than females. The complex effects of density on human social behavior and suggestions for future research are discussed.

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CHAPTER I

INTRODUCTION

Studies of a number of animal populations suggest that high levels of population density often produce a number of pathological behavioral and physiological responses (Calhoun, 1962; Davis, 1972; Myers, et al., 1972). The results of these and other studies have led to speculations concerning the implications of density for human populations.

The idea that human and animal social behavior may be altered by conditions of reduced space has only recently been brought under rigorous, scientific investigation. An important stimulus for such research would appear to be the living experience of most present day urban dwellers, who must daily endure such stresses as bumper to bumper traffic on their way to and from work, "crowded" subway conditions, long lines for almost any service or recreation they seek, and a critical housing shortage.

Others are excited by the increased social stimuli found in densely populated urban communities, stating that such areas are centers of creativity and technological advance (Proshansky, et al., 1970).

Gehlback (1972) and Olin (1972) have argued that high density centers may produce positive effects, especially as a human population regulatory mechanism. Since we will continue to have high concentrations of people in many areas for the foreseeable future, it is necessary that we learn more about both the positive and negative aspects of this phenomenon.

The relationship between a rigid hierarchical social system and high density conditions has been given less public attention. Leyhausen (1970) argued that the problems of "crowding" have sometimes been solved by a tyrannical social order in which a few have much and proportion the rest out to the many. While such a system may at first seem unfair, it provides a means of survival for the society. Open and equal competition between all members for limited resources could only lead to social disorder. A rigid, unquestioned system of priority of access to incentives would serve to reduce aggression within a society. While Leyhausen's ideas are basically taken from animal research, it remains a matter of question how human social stability is related to high density conditions, and if such a well-defined hierarchical system, should it be lacking, contributes to the maladaptive social behaviors so often attributed to "crowding."

Before we review the literature in this field, an important distinction between density and crowding should be noted. Proshansky et al. (1970) and Stokols (1972) have cautioned that these terms have been used indiscriminately by the public as well as a number of authors. "Density" is concerned with the number of individuals per space unit, and involves some spatial limitation placed on an organism; while "crowded" is an experiential state, a perception of the organism which may or may not result from such limitations. Proshansky explained that whether or not the individual experiences a situation as crowded may depend upon a number of factors other than the number of persons per unit area; such as, cultural norms and expectations, the positive

or negative atmosphere of the situation, and the extent to which one is frustrated in the pursuit of one's goals by the presence of others.

It is important that we keep the difference between density and crowded in mind, and not attribute to crowding, effects produced by the experimental manipulation only of density.

CHAPTER II

LITERATURE REVIEW

The literature concerned with the issues of crowding and density covers four general areas: animal studies in both experimental and natural conditions, correlational surveys, experiments on the human awareness and use of space, and research in which density is manipulated directly in order to ascertain its influence upon human behavior.

I. ANIMAL STUDIES

A few animal studies have dealt with the physiological effects due to conditions of differential density. As this project is concerned primarily with the changes in social behaviors as a result of spatial manipulations, only research efforts along this line will be noted. Should the physiological aspects of this phenomena interest the reader, he is referred to the following sources: Davis, 1971; Deevey, 1960: and Thiessen and Rodgers, 1961.

A number of other studies in the last several years involving the use of animals have purported to show that over-crowding places an unusual stress on the organism, which may lead to social maladjustments of various forms and possibly to the eventual destruction of both the individual and the organization of the group of which he is a member. Myers et al. (1971) examined the effects of varying density on several aspects of rabbit behavior, one of which was intra-group aggression. In one experiment, they held population size constant, and reduced the

area of the enclosure first by one-half, and then by three-fourths. In the latter condition, the frequencies of aggressive behaviors in both sexes increased three-fold.

These authors also varied the size of the group of rabbits, but found that the highest rates of aggression occurred when normal social groups were restricted spatially, rather than when group size was made larger than normal with living space held constant.

Myers et al. stated that the "key to reaction to density in rabbits appears not to be in increase in numbers per se, but to some qualitative decrease in living space. . . . this may be intrusion by some members of the group in to . . . what is called 'ego space' or 'personal space' by other workers" (p. 178).

In 1962 J. B. Calhoun conducted a series of oft-quoted experiments with albino rats. Each experiment began with either 32 or 56 rats, just past weaning, placed in a series of interconnecting cages. Calhoun allowed the population to increase to eighty animals, several times the number of animals that would have occupied an area of equal size in a natural environment. His description of the "behavioral sink" which developed seemed to indicate that disorganized maternal behavior, increased aggression, homosexuality, and cannibalism were the inevitable results of high population density.

An important criticism of Calhoun's study elucidated by Johnson (1972) was that Calhoun seems to have begun the experiment with a socially disorganized or unacquainted group of rats. The aggression and social pathology he observed may thus have partly been the result

of the group's trying to establish a social hierarchy rather than simply the effect of limited space per individual. It is noteworthy that in the pens whose construction facilitated the establishment of a stable social structure and territorial dominance, the "behavioral sink" did not develop.

Calhoun performed an earlier experiment in which density and the social organization of the group also seem confounded. In 1948 the researcher caught and marked 164 rats in one city block of Baltimore, what he estimated was the total population of that area. Then he released over 100 new rats into this block, and sat back to observe. The result was a large increase in the number of dead rats, consisting principally of new rats, but including many of the resident ones as well. The overall population of rats in the area decreased after this manipulation. But what caused the increased violence? The sudden doubling of the population density or the disruption of the established social order by the introduction of foreign rats, or both?

Brown (1953) compared fighting in a stable population of house mice with the frequency of fighting in a group of captured mice who were strangers to each other. The disorganized group was significantly more aggressive than the group with the well-established social hierarchy.

Wolfe and Summerlin (1968) trapped a whole, organized group of cotton rats from one area and, subsequently, trapped another group over several areas. The disorganized groups showed many more agonistic encounters during the first twenty-four hours. By this point the group of rats who were strangers to one another were able to establish

a dominance hierarchy, and there were no further differences between the two groups in the frequency of agonistic behaviors. The authors concluded that social disorganization, rather than "crowding," seemed to be the major factor influencing the intense agonistic behavior often observed in caged populations of rats and mice.

All of the studies noted above involved the use of rodents. McGrew (1972) found that this is true of most density-behavior studies for several reasons: the small body size allows for large numbers of animals to be easily and efficiently accommodated, there is already a large body of physiological and behavioral data on these species, they mature quickly, and the death of several individuals results in little expense and few ethical considerations. On the other hand, the many problems which primates pose in these areas probably constitute the reasons why research regarding the effects of density on the social behaviors of this group is more scarce.

DeVore and Hall (1965) observed that overt aggression between natural groups of baboons was less where population density was less. And Kummer (1968), in Ethopia, found that Eastern groups of baboons had higher frequencies of male-male aggression where the group sizes were 2-3 times as great as they were in Western Ethopia groups.

Southwick (1967) was probably among the first to experimentally study the differences in primate social behavior under varying conditions of density. He found that when he reduced the size of the enclosure of a group of disorganized, captive rhesus monkeys by fifty percent, the frequency of agonistic encounters within the group increased significantly.

In a 1968 article, Southwick discussed several experiments he had completed in India. In one study he noted that of three groups of rhesus monkeys, the most crowded group evidenced the highest frequency of aggressive encounters. The captive animals were more aggressive than farm or temple groups, which were, in turn, more aggressive than a group living in a forest. (Aggressive interactions in this research as in most of the animal studies cited, were defined by the occurrence of specific behaviors within the categories of threat, attack, or submissive responses.)

Since Southwick was not able to capture a wild group intact, he was forced to use a group composed of animals wild-trapped from different groups for his caged population. He noticed that the highest attack scores of all three groups occurred in this group during the period in which the dominance hierarchy was being worked out. Again, was the increased aggressiveness in the captive group due to high density or to lack of an established social structure through which order could be brought to social chaos, or from both factors?

An investigation of the social behavior of both free-ranging and domestic cats was undertaken by Leyhausen (1970). He put several adult tom-cats and a number of females, all strangers, into a cage, and found that there was the usual first several days of fierce fighting. After this brief period of aggression, a dominance hierarchy was established. Threat displays then became the principal means of maintaining rank.

Leyhausen noted that if the cats were then put into smaller cages the communal society began to break down. A tyrant emerged and some

cats were so often attacked by others that they seemed to become "neurotics." The author described the cats as a "spiteful mob"; seldom able to relax. They were continually hissing and often fighting. Play stopped, and movement about the enclosure was reduced to a minimum. Leyhausen clarified that these are qualitative statements about his observations, rather than quantitative results.

It was previously demonstrated in relation to rodents that "crowding" of well-established groups had less destructive effects than "crowding" of less organized aggregates.. The same conclusion was reached by Alexander and Roth (1971) investigating the effects of acute crowding on aggressive behavior of Japanese monkeys. When these authors placed an intact group in a restricted space, mainly milder forms of agonistic behavior were increased, and the social structure did not break down. There was a major increase of dominant and middle-ranked males attacking subordinate males, and a significant increase in the submissive behaviors of middle and low-ranking adult females and juvenile females. Males seemed to tolerate more easily closer proximity to subordinate females than to subordinate males. As indicated by the direction of the aggressive behaviors, crowding only seemed to increase the conformity of the troop to the established dominance hierarchy rather than to disrupt it.

II. RESEARCH WITH HUMANS

What of human density research? Much of what has been written concerning human over-crowding has been extrapolated from the animal

literature noted above, and has thus emphasized the negative aspects and the increased agonistic behaviors with increased density. One is indeed tempted, as were Anthony Storr (1968), Desmond Morris (1969), and Robert Ardrey (1970) to suggest analogies to human social conditions. As impressive as many of these speculations are, one must be cautious of predicting human behavior from animal studies. As Rene Dubos states:

> The readiness with which man adapts to potentially dangerous situations make it unwise to apply directly to human life the results of experiments designed to test the acute effects of crowding on animals. (Dubos, 1970, p. 207.)

A brief review of the literature will substantiate the fact that there is relatively little clear-cut empirical evidence for speculations concerning the effects of limited space on human social behaviors.

One of the first workers to recognize the possible deleterious effects of high density situations was Plant (1930). His clinical experiences left him with the untested impressions that children and adults exposed to "crowded" living conditions were often fearful of being alone, were too dependent, lacked idealism, were too early exposed to sex, and became emotionally disturbed with the strain of constantly having to get along with others.

Later studies have generally been more empirically oriented. A number of these were of a demographic, correlative nature. The basic approach was to operationally define density in some manner, such as, persons per acre, and to correlate it with different indices of individual or social breakdown.

Schmitt made two such studies of Honolulu (1957, 1966). In both he compared such indicators of density as average household size, persons

per acre, and number of dwelling units per structure with juvenile and adult crime rates, death rates, suicide rates, venereal disease, admissions to mental hospitals, etc. With the exception of household size, four of his measures of density were positively correlated with all of his indicators of individual and social disruption. Winsborough (1965) at first found similar results in Chicago using many of the same measures. One of the difficulties with the interpretation of these studies is that density is correlated with a number of other social factors, for example, education and income, which are, in turn, correlated with certain types of social problems. Therefore, it is necessary that these other factors be controlled for if the contribution to social ills of density alone is to be accurately determined. Both Schmitt and Winsborough partialled out the effects of many of these extraneous variables. Schmitt (1966) controlled for education and income and still found high positive correlations between density and most of his dependent measures. But when Winsborough (1965) performed partial correlations he found that there was actually a negative association between density and disease, morbidity, and the need for public assistance.

Mitchell (1971) analyzed data gathered by three large surveys in Hong Kong, the most densely inhabited area in the world. He made the point that it was the number of different families within a dwelling unit, not the number of persons per square foot which caused the residents to feel "crowded." Living with nonkinsmen in the same

dwelling was more difficult than living in more dense conditions with only one's family; more difficult in terms of several measures of emotional strain. Physical features of the environment such as numbers of persons per unit, the internal partitioning of the dwelling, and certain physical amenities were all unrelated to levels of emotional strain. It appeared that the social features interacted with spatial factors as determinants of interpersonal stress.

Galle et al. (1972) more clearly delineated an interaction model between social structure variables, density and social pathology. This group analyzed the frequency of occurrence of a number of pathological behaviors as density varied in different areas of Chicago. With density operationally defined as persons per acre, and social class and ethnicity held constant, the correlation between density and pathology approached zero. But when density was determined by the number of persons per room or the number of housing units per structure, high positive correlations resulted. The authors suggested that defining density in terms of the number of persons per room taps into these social problems on an intra-familial level; and the number of units per structure on an inter-familial level. These last results support Mitchell's findings that when members of separate families are forced into interpersonal contact by dense conditions, the result is often social stress.

The implication of these two studies is that density seems to act as an intervening variable between social factors and pathology. Given conditions of great enough density, forcing persons who may be

unacquainted or who consider each other as "outsiders" into interpersonal contact will often result in some form of anti-social behavior.

Brief mention should be made of the work of Hall (1969), Little (1965), and Sommer (1969) in the fields of proxemics and personal space. Although not principally oriented toward answering questions related directly to density, the research efforts of these workers indicate that man is certainly aware of and responds to the space around him, particularly as it applies to interpersonal interaction.

A fourth body of research involves experimental efforts to examine the changes in human social behavior under varying conditions of density. One of the few density studies carried out under controlled circumstances was conducted by Ittelson et al. (1970). These workers attempted to assess the effect of size of bedroom on the social behavior of patients in a psychiatric hospital. They found that passive, non-social behaviors occurred more frequently in the larger rooms, and concluded that a smaller space was more conducive to social interaction. But they failed to account for the fact that larger bedrooms usually house more patients. It is likely that the social withdrawal they evidence was, in part, due to the increased number of patients in the room and the threat such an overwhelming quantity of social stimuli posed for these persons.

Osmond (1970) argued dramatically from anecdotal evidence that mental patients must not be overcrowded; must not be forced to interact with others when they do not wish or are unable to do so. The author stated, "We are not used to living in crowds and the attempt to do so

is unpleasant even for healthy people. It can so damage the mentally ill that they lose all hope of recovery" (p. 563).

Freedman, Klevansky, and Ehrlich (1971) provided some evidence that crowding may have differential effects depending upon who is being crowded, and the situation in which it occurs. These authors put groups of people for four hours into rooms that were so "crowded" that they would admit no one else seated, or into relatively less dense conditions. The "crowded" condition was less than four feet square per person, and the "uncrowded" situation allowed 15-20 feet square per person. Despite these very dense, but short-term circumstances, they found that density had no effect upon such task performances as memorization, crossing out random numbers, or solving puzzles.

The researchers did find some social-behavioral differences between the sexes. High school boys were more competitive in the smaller room, while increased density decreased the girls' competitiveness a little. And in a group of men and women, ages 17-80, recruited by newspaper advertising, men gave more severe judgments on court cases, found the experience less pleasant, and considered the other participants less friendly in the crowded circumstances than in the larger room. Women were found to react exactly opposite. When mixed groups took part in the study, no effects were found either for the group as a whole, or for men or women separately.

In none of the groups was there a dramatic effect upon anti-social behavior; although the negative sentiments toward one another afterwards expressed by many of the men may have become more overt and disruptive

had they been crowded together longer and not known that the experiment would be over within four hours. The authors further recognized that density primarily affects social behaviors. One of the reasons they may not have obtained more dramatic results was that the subjects were seated in their chairs most of the time, working on their individual tasks, and had little opportunity for interaction. Separated quite comfortably from one another by the furniture, they recognized that there was little need to make interpersonal adjustments which such proximity usually dictates. There are four notable experimental studies concerning the effects of density upon small groups of children. Probably the first effort in this area was made by Hutt and Vaizey (1966). As McGrew (1972) noted, there are two types of density often confounded by other workers; social and spatial density. The former is manipulated by varying the number of individuals involved, and the latter by the amount of space allotted a given sized group. Hutt and Vaizey chose to observe three different-sized groups all composed of autistic, brain-damaged, and normal children in the same hospital playroom. They found that the brain-damaged children became significantly more aggressive, and that normals spent slightly more time in aggressive-destructive behaviors, and less time in non-aggressive social interaction as group size increased. At least two factors apart from density could have contributed to this result. First, the increased numbers of children competing for the same toys could have yielded the higher levels of aggression. Secondly, only 2-3 of the subjects were present in any one session. Other children from the hospital formed the rest of

the groups. Such a manipulation left uncertain the extent of familiarity of the groups formed, a factor which several animal and human studies have shown to be of some importance.

A second study involving children was made by P. L. McGrew (1970). While the emphasis of her research was upon spacing behavior, she found that less physical contact between children occurred at higher social densities.

Thirdly, Chalsa M. Loo (1972) examined several social behaviors in ten groups of four and five year olds. Each group was composed of three girls and three boys, and all subjects were acquainted with each other. Density was manipulated spatially, rather than socially, allowing either ninety or fifteen square feet per person. Contrary to expectations this author found significantly less aggression when spatial conditions were reduced. Corraborating earlier findings by Hutt and Vaizey (1966) and P. L. McGrew (1970), Loo also noted that the children reduced their frequency of social interaction in the "crowded" condition.

The author suggested that social and spatially determined densities may have different effects on aggression. Where space is held constant, new participants may be seen as the cause of social disruption. Interpersonal aggression should increase. When space is varied, the members face new density conditions whose change is common to them all. The environment, rather than one another, may be perceived as the stressful factor. The frequency of agonistic social behaviors in this situation should be less.

One of the reasons Loo may not have found increased aggression in his "crowded" condition was that the observations of both situations involved only one forty-eight minute play session each. Had the children been exposed to "crowding" for a greater period of time, the results may have been different.

A fourth researcher, W. C. McGrew (1972), examined the effects of density on the social behavior, particularly the motor patterns seen in agonistic interactions, of nursery school children under more natural conditions. He observed a group of children during their free-play period under several conditions of density ranging from 37 to 86 square feet per subject. McGrew manipulated both social and spatial density. He hypothesized that increasing social density, by increasing the number of persons with whom negative interpersonal interactions could occur, would have more dramatic effects upon the children's behavior than would spatial density differences.

There was little evidence of a straight-forward relationship between density per se and the occurrence of children's social behaviors. But some differences were observable when social and spatial density conditions were compared. When spatial density was increased, one aggressive pattern (hit), two fearful patterns (automanipulate and digit suck) and one pattern occurring often in response to fearfulness in others (contact) increased in frequency.

Under high social density conditions most of the behavioral measures such as automanipulate, immobile, and negative expletive differed in the opposite direction predicted. Only hit increased. Why was this? The author explained that the children appeared to go out of their way to avoid agonistic encounters when social density

was high. This is one explanation, especially when we note that Felipe and Sommer (1966) and Sommer (1969) have found that most persons reacted with discomfort and aggravation when others approached them too closely, invading their "personal space." If the invader maintained this unusual proximity, the subject usually began to feel quite anxious and left, if he was able; rarely did he react aggressively to this intrusion.

Although the children in McGrew's study could not leave the playroom, they could have maintained a certain maximum level of social contact through spacing. Even in the most dense condition of thirty-seven feet square per person, the children could have avoided intruding upon each other's personal space.

There is another explanation. At the beginning of the study, McGrew predicted a doubling of agonistic interactions when the size of the group was doubled; that is, using 100% of the group as opposed to 50% of the group in the same space. What he failed to realize until after the study was completed was that in changing the social density he had manipulated not only the number of people per area, but the social structure of the group as well.

It seems probable that at best a partial social heirarchy could have been established as the children were randomly split in half each day during the 50% condition, one-half playing in the room in the morning and the other half playing there in the afternoon. Such an arrangement certainly upset the group social structure, throwing children together who rarely played with each other when the group was intact.

With this in mind, we see that in the "socially crowded" conditions with 100% of the group, the probable existence of a dominance hierarchy may have been working to reduce the agonistic behaviors. In both the "socially uncrowded" conditions, involving 50% of the group, the dominance hierarchy present in the intact group was disrupted, and agonistic behaviors may have remained for this reason even in less dense conditions. Thus the lack of dramatic differences as the author predicted.

In his statistical analysis McGrew employed the Mann-Whitney U Test for independent groups, while it is clear that the groups he observed often had overlapping membership. A less conservative non-parametric procedure for such related groups would have been the Wilcoxon Matched-Pairs Signed-Ranks Test (Siegel, 1956).

Regardless of the explanation, McGrew's findings failed to support his hypothesis of increased aggression in higher social densities as the result of increased probability of encounters. Nor do these data support Loo's reasoning that the children were aware of the source of their increased discomfort as either the reduced environment or more children.

It should now be evident to the reader that, while some research effort has been made to understand the effects of varying conditions of density on human and animal social behaviors, few statements can be made with confidence; statements which are clearly supported by the majority of the literature. And the results of the studies involving human reactions to density seem even more muddled than those findings

concerning other animals. A number of variables which may influence density behavior in man have been postulated. These include social versus spatial density, degree of crowding, pleasantness of living conditions, and type of personality.

One factor which has been directly explored only in the animal work is the degree of relationship between the interactants; where several studies have shown that intact groups with well-established social hierarchies involving acknowledged dominance-subordinance relationships are less negatively affected by conditions of high density than are groups of animals which have no such means of controlling intra-group aggression.

Therefore, it was decided to investigate the influence of low and high spatial density conditions on the social behaviors of well-acquainted versus recently established groups of pre-school children, on the assumption that the former group would have a stable social structure, and the latter an unstable dominance rank order.

CHAPTER III

STATEMENT OF THE PROBLEM

The study addressed itself to several questions:

1. How might the dominance hierarchy of a well-established group of pre-school children be described?

2. Does a group of children, many of whom are strangers to one another, also have or quickly form such a social ranking? How is it described?

3. How do low and high spatial density conditions during free-play affect the agonistic, non-agonistic, and quasi-agonistic behaviors of an intact, well-established group of pre-school children?

4. What are the frequencies of these behaviors when a group of children, most of whom are strangers to one another, is allowed to play in low density conditions?

5. How does reducing the play area of this group of relative strangers affect the occurrence of these social behaviors?

While there were no specific hypotheses, it was expected that the children who were well-acquainted with one another would have a well-defined group status structure, established through several months of association. Such an organizing mechanism, it was expected, would reduce the negative or anti-social effects of increased spatial density upon the social behaviors of the group. That is, the researcher predicted an increase in agonistic behaviors, and a decrease in the frequency of non-agonistic and quasi-agonistic behaviors of both groups from "uncrowded" to "crowded" conditions, but to a lesser degree for the established group.

CHAPTER IV

DEFINITIONS OF TERMS AND MEASURES

Dominance Hierarchy

The term "dominance hierarchy" has been referred to several times, and its relation to the reduction of conspecific aggression discussed. It is appropriate that more attention be given the concept at this time.

Dominance has enjoyed a number of different definitions. Priority of access to incentives is one of the most widely accepted operational definitions of this term. That is, when two animals compete for the same object, be it food, water, territory, or a mate, the winner is usually judged the more dominant (Berkson and Schusterman, 1964, cited by McGrew, 1972; Carpenter, 1950, 1954; Crawford, 1940; Jay, 1965; Zucherman, 1932, all cited by Bernstein, 1970; and Sade, 1967, cited by Johnson, 1972).

Other authors have pointed out that dominance is much more complicated, and that a number of behaviors seem to indicate various types of dominance relationships exist. For instance, macaque social orders have been shown to include alliances between subordinate and higher-ranked males, by which the former gains in status when the latter backs him up (Varley and Symmes, 1966). Van Lawick Goodall (1971) has described much the same kind of relationship in the chimpanzees she has observed in the Gombe Stream Reserve.

Iven DeVore (1965) and M. R. A. Chance (1967) have noted the existence of "cohort groups" or dominant coalitions in baboons and other

primates. These small groups of adult males usually remain in each other's presence, and seem to gain much of their status through their cohesiveness.

Another measure of dominance is the direction of agonistic encounters. Bernstein (1970) quotes a number of researchers as having found a virtually unidirectional relation between dominants and subordinates in every possible dyad of a primate group--the dominants almost always attacking or threatening those of lesser status. This measure they found correlated very highly with priorities to incentives such as food, sexual partners, grooming, territory, and other desirables. Such a "peck order" arrangement was first noted in chickens by T. Schjelderup-Ebbe (1922, 1935), cited by Eibl-Eibesfeldt (1970).

The assumption of certain roles of influence such as that of defender of the troop from outsiders, controller of intra-group aggression, and guide to areas of forage are other indicators of dominance behavior. Johnson (1972) remarked that the dominant male baboon performed all these functions, while Bernstein (1970) indicated that these social roles and their relation to dominance in most primates are still imperfectly understood. Rowell (1966) found that the best indicator of dominance in baboons was frequency of approach to other members of the group, and frequency of avoidance or withdrawal a measure of subordinance. Both she and Chance (1967) emphasized the behavior of subordinates in maintaining the social hierarchy.

M. R. A. Chance (1967) felt that it was the attention which the subordinate animals maintained toward those higher in the hierarchy

which both bound the group together and defined for the observer which are the more dominant animals. In terms of "attention structure," the most dominant animals in a group were the ones upon whom most of the others' attention was centered, rather than the most aggressive animal.

Studies of human "leadership," "power," and "dominance" have employed many of the same measures used in the animal research. Leadership in a nursery school class was examined by Parten (1933) who noted that several types of behavior occurred which could be described as dominance. One high ranking member used force to coerce the others to follow his directions. Others seemed to take a responsible part in the group decision-making, and would direct the activities by assigning roles to the other members.

The ability of one person to influence the behavior of another has been termed "power" by several workers (Lippitt, Polansky, Redl, and Rosen, 1952; Gellert, 1961, 1962). Lippitt et al. observed boys in two summer camps as they naturally tried to influence each other's behavior. They found that both behavioral contagion and direct influence characterized high "power" boys, and that the less powerful members of the group reinforced the position and influence of the high ranked members. These influential processes were particularly effective when the group's power hierarchy was relatively stable and uncontested.

Gellert observed nursery school children in pairs during play. She noted six power-related behaviors which in both studies were able to clearly differentiate the children into a social order. Her

results indicated that children of both sexes demonstrated a significant degree of consistency with regard to rank order within their own group when they played with the same partners.

The aggressive/threat or peck order nature of dominance has been emphasized by M. G. King (1966). In his work with 3-5 year old children, he defined the dominant subject as one whose number of unfriendly acts to S2 was .1 greater than the number of unfriendly acts of S2 to S1. King did not define his measure of "unfriendly acts," which makes the interpretation of his results difficult.

Blurton Jones (1967) has stated:

> Dominance says nothing useful or instructive about the social organization of the class of three to five year olds I have observed or of the groups within it. Certainly some individuals regularly won fights but these were not also leaders or peace keepers or given priority access to objects (p. 36).

Other workers have found the idea of priority of access to objects useful for studying children's groups. In 1972 W. C. McGrew successfully described a dominance hierarchy amongst eighteen pre-school males. His criterion was winning an object struggle in an agonistic-quasi-agonistic encounter. The number of wins a boy made was significantly positively correlated with his position in the social order of the group. McGrew reported that Thompson (1967), in an unpublished manuscript, found high correlations with object struggles, teacher rankings of dominance, and sociometric ratings of popularity by peers.

One of the measures of dominance used for the present research study was the winning of object struggles. McGrew (1972) defined this interaction as an "attempt by two or more children to gain or retain

possession of an object, usually a toy" (p. 139). The winning of object struggles had significant advantages as a measure of dominance in that it was most direct, it was easily observable in natural play situations, and it had good correlations in past research with other measures of dominance.

In addition to object struggles, two other measures of dominance were employed in this study: teacher rankings and sociometric peer ratings. The teacher familiar with each group of children ranked them on a number of dimensions including dominance, aggressiveness, sociability, cooperativeness, friendliness, intelligence, and activeness. No definitions of these terms were provided the teachers.

A third measure of dominance utilized was peer ratings. Such sociometric methods have been used by L. D. Zeleny (1960) to measure social status of group members, by Wherry and Fryer (1960) to determine leaders, and by Thompson (1967) to evaluate dominance.

Because this procedure seemed to yield a measure of peer popularity, another method was used for the group of strangers. Each of the children was asked "Who is best at getting what he wants when he wants it, and gets others to do what he wants them to do? Who is second best? Who is third best?"

Use of these three different measures gave some idea of how the group members viewed their social rank order, how their teacher saw them, and how they actually behaved in a play situation.

Agonistic Behavior

As R. N. Johnson (1972), Blurton Jones (1972), W. C. McGrew (1972) and others have pointed out, the term "aggression" is an often-misused,

multi-dimensional concept which probably has no single, simplistic definition. In part the ambiguity of its meaning derives from its indiscriminate use in everyday life. Although many people seem to "know" what we mean when we use the word aggression, a closer inspection shows that it may refer to a wide variety of emotional states, a personality trait, an innate biological drive, or learned responses to particular stimuli. For some workers it involves intent, for others not.

The complexity and diversity of human "aggressive" behavior make the effort of a unitary definition futile and restricting. Rather we must examine in their own right various aspects of this phenomena.

Johnson (1972) points out that the term "agonistic behavior" has enjoyed a much wider use amongst scientists as an alternative for aggression, without acquiring many of the emotional overtones the latter has taken on in lay use. "Agonistic behavior" refers to "fighting and competitive behavior, usually in animals, and includes threats and offensive attacks as well as defensive fighting" (Johnson, 1972, p. 8).

W. C. McGrew (1972) sees agonistic behavior as the general category, and aggressive behavior as one of its subcategories, including fearful and defensive behaviors. Because this investigator was interested in observing the effects of density on behaviors which were involved in offensive as well as defensive fighting, in threat as well as competition, the broader category "agonistic" seemed more appropriate.

During many months of observation, McGrew noted several behaviors which occurred together in agonistic encounters amongst nursery school children. These were: hit, back, negative expletive, push, pull, object destruction, and object struggle.

An analysis of the social behaviors of young children at play has also been made by P. K. Smith and K. Connolly (1972). The behaviors which they termed agonistic included: threat, hit, fight, flight, try to take toy, and try to keep toy.

Blurton Jones (1967) observed 3-5 year olds at play. He was looking for motor behaviors which were fairly constant in form, and which occurred frequently. He found that when the children fought, it was almost entirely over property; such encounters ending with one child gaining the toy, and the other moving a short way off. Behaviors which occurred frequently in these circumstances were: close hand beat, bite, frown, weep and pucker of brows, and arm raised over head or in front of face with the forearm horizontal. Threats also occurred here in the form of loud scream--red face--beat at but not hit--and approach opponent.

In 1972 Blurton Jones used the term "aggression" to refer to a similar grouping of behaviors: fixate, frown, hit, push, take-tug-grab.

Quasi-Agonistic Behavior

A set of behaviors closely related to agonistic motor patterns, and confused for these by some researchers, is that of quasi-agonistic behavior; what Blurton Jones (1967) referred to as "rough-and-tumble play."

Blurton Jones explained that this category was drawn from Harlow and Harlow's (1962) observations of play in rhesus monkeys. Blurton Jones (1967) used this category to refer to ten behaviors which he found often occurring together in the children he observed: run, chase, flee,

wrestle, jump up and down with both feet together, beat at each other without hitting and with open hand, beat at each other with object without actually hitting, laugh, play face, and fall.

These behaviors appeared very similar to agonistic behaviors, but the roles of the participants often rapidly alternated, and the behavior did not result in possession of objects nor in spatial separation of the interactants nor injury.

In 1972 Blurton Jones defined "rough-and-tumble play" as: laugh, run, jump, hit at, and wrestle.

Smith and Connolly (1972) included as rough-and-tumble-play the behaviors: wrestle, fall over, chase, flee, play beat, play, no toys involving run or hop, and jump.

McGrew (1972) defined "quasi-agonistic" behavior as "vigorous, gross activity which does not result in separation or injury" (p. 22). The interactions he observed which did not end with the participants separated formed a constellation of behaviors including: chase-flee, laugh-smile-play face, jump-quick hop, fall-wrestle prone.

Non-Agonistic Behavior

The four authors mentioned above have also described several behaviors which were not agonistic, and were neither part of rough-and-tumble play. Smith and Connolly included in their category of "social-interactions": holds out object, walk or run to, physical contact, rejection, appeal to nurse, cuddled by nurse, helps child, cooperation with nurse, and non-cooperation with nurse.

Several of these motor patterns were included by both Blurton Jones and McGrew under the former's "social" factor, and the latter's

"non-agonistic" category. Blurton Jones found high loadings for point, give, receive, talk, and smile for his factor connected with social interaction between children.

McGrew saw seven behaviors occur significantly more often in non-agonistic interactions than in agonistic-quasiagonistic encounters. These were: hold hands, normal face, physical contact, point, shoulder hug, walk, and verbalize.

From the investigations noted above, the present researcher chose five examples from the class of agonistic behaviors, five from the class of quasi-agonistic motor patterns, and three from the non-agonistic category. The behaviors selected for use in this study seemed the least ambiguous in definition, and were agreed upon by at least two of the three principal investigators discussed above. They were also interactions which the present worker saw occur in the nursery groups he observed, and could be readily distinguished on audio-videotape.

Definitions of Social Behavior Categories and Circumstances in Which They Occurred

The category of agonistic behaviors included:

1. Hit--beat and punch
2. Push-Pull
3. Object Struggle
4. Negative Expletive
5. Object Destruction

Hit. Beat--"An overarm blow with palm side of the lightly clenched fist. The arm is sharply bent at the elbow and raised to a vertical

position then brought down with great force on the opponent, hitting any part of him that gets in the way" (Blurton Jones, 1967, p. 365).

Punch--"The arm is moved rapidly from an approximately horizontal position at the side, forward approximately 180 degrees (or until contact) in a sidearm motion. The arm is held partially flexed; the fist is tightly clenched; and the knuckle side of the hand proceeds" (McGrew, 1972, p. 81).

The occurrence of either beat or punch was scored as "Hit." Also included as "Hit" was the striking of a child with an object.

"Hit" often, but not always, occurred during an object struggle. Hit with a soft object, such as doll's clothing, accompanied by a laugh or smile and no separation of the participants, was often not perceived as agonistic, but as play behavior. Hitting with a hard object was no longer considered rough and tumble play, and usually brought crying and/or fierce retaliation.

Push-Pull. Push--"The arms extended forward, usually in parallel and horizontal, with the wrists flexed and the vertical palms preceding; force is directly applied to a person" (McGrew, p. 82).

Pull--"The arms are flexed toward the body, usually the chest, thus drawing a person toward the body or vice versa" (McGrew, p. 80).

Push and Pull were not scored separately, but as "Push-Pull."

This behavior was manifested most often during object struggles. Pushing often was more harmful than hitting, as the pushed child sometimes lost his balance and hit his head against the furniture or on the floor.

Object Struggle. "Attempt by two or more children to gain or retain possession of an object, usually a toy" (McGrew, p. 139).

This study emphasized the winning and losing of object struggles as a measure of the group's dominance-subordinance relationships. In many instances, two children would pick up a toy at the same time, but no visible signs of a struggle were evident. Possibly a brief glance would be exchanged, and one child would remove his hands from the object. Other times one child would go over to where another group member was playing and without hesitation take an object out of his hands, without outward objection from its previous user. Such instances in which subordinate subjects bowed to the desires of more dominant members seemed to serve as important preservers of group harmony and of the established social order.

Negative Expletive. "A short, explosive verbalization in the negative imperative; for example, No!, Stop!, Don't do that!" (McGrew, p. 183).

Negative expletive often accompanied and especially followed object struggles or agonistic encounters. Some examples of negative expletives observed were "Stop!", "Don't do that!", and "I don't like you!". Other times loud screeches, rather than words, were utilized to communicate disapproaval. Crying, which occurred infrequently in both groups, immediately cornered everyone's attention in the room, and all activity ceased to watch the outcome of the altercation.

Object Destruction. "Manipulative behavior directed to objects which results (or could easily result) in their damage or destruction" (McGrew, p. 183).*

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*Parenthesis mine.

When allowed to play without interference, both groups damaged toys and several pieces of furniture. Object destruction often seemed to have the properties of rough-and-tumble play. Two or more children, many times laughing, running, and jumping, would model each others' destructive behaviors. For example, if one child threw a truck against the wall, others would watch and follow his example.

In other instances toys were thrown in play near another child, seemingly without the intention of hitting him. The pleasure in this game seemed to derive not only from the destruction to the toys, but from throwing near to but not harming a playmate. Should a child be harmed, the "tone" of the game might very suddenly become agonistic.

Other times object destruction appeared to be a redirected agonistic activity. When a child seemed frustrated and angry at another group member, but was fearful of approaching him, he sometimes took his feelings out on an inanimate object.

A number of other motor patterns occurred which appeared to be agonistic in nature; such as, kicking, biting, and spitting. Other more subtle behaviors were teasing statements and laughter at another's failure or injury. These behaviors occurred infrequently in both groups.

The "non-agonistic" behaviors observed were:

1. Walk
2. Hold Out
3. Physical Contact

Walk. "The body moves bipedally forward at a moderate rate, alternating legs during each stride so that one foot is placed firmly

on the ground before the other leaves the ground. The trunk is upright, and the arms swing forward and backward in unison with the opposite legs" (McGrew, p. 112).

Two or more steps constituted a walk, and a pause of two seconds or more was necessary to score walk again.

Walk was one of the most frequently occurring of the motor patterns observed. The children also used a number of other means of locomotion to move about the room. They would slide their feet across the floor as in "skating," crawl on their knees, shuffle like a train, and roll on the floor.

Hold Out. "The arm is extended horizontally forward, fingers partially extended and together, and usually clasping an object with the palmar side up. It is often directed toward a person and followed by releasing the extended object" (McGrew, p. 78).

If another child moved toward the extended object, "Hold Out" was not scored unless the object was released as soon as the other child grasped it. However, the other child did not have to receive the object for hold out to be scored.

Hold out often appeared to serve as an appeasement gesture. A little while after two children had fought, usually the one who lost approached the other and held out an object such as a toy. Sometimes hold out was solicited, other times not.

Physical Contact. Physical Contact--"This category includes any amorphous, unstereotyped, unstructured tactile contact between children. It ranges from finger-tip touching to standing surrounded by jostling peers in a line" (McGrew, p. 101). This did not include agonistic contacts.

Hold Hand--"Two children grasp each other's hand, palm to palm, usually while facing the same direction, holding inside hands" (McGrew, p. 77).

Shoulder Hug--"The partially flexed arm is draped on and around another child's shoulders. The hand usually rests on the other child's far shoulder and may grasp it lightly" (McGrew, p. 103).

The occurrence of either physical contact, hold hand, or shoulder hug was scored as one physical contact.

A great deal of random physical contact between the members of a group was not observed in this study. The children seemed very aware of where their bodies were in relation to others around them. Children could be standing very close to one another and not touch for extended periods of time. Much of the random contact which did occur seemed to take place when two children, obviously interacting positively, were sitting close to one another, side by side, legs and arms often brushing lightly against those of the child seated beside them.

The group of quasi-agonistic behaviors observed in this study were:

1. Run
2. Jump-Hop
3. Laugh
4. Fall
5. Wrestle

Run. "To move the body rapidly forward, alternating legs during each stride, so that both feet are simultaneously off the ground during each stride" (McGrew, p. 228).

This behavior pattern appeared an important element of rough and tumble play, occurring often with laugh, fall, and jump-hop. Boys seemed to engage in more running than girls.

Jump-Hop. Jump--"The legs and feet are rapidly extended, launching the body into the air so that it lands approximately upright with both feet together and with partial leg and feet flexion. The arms are usually held out from the body" (McGrew, p. 99).

Hop--"The legs and feet are rapidly extended in alternation, repeatedly launching the body into the air so that it lands approximately upright on alternating feet. The landing involves minimal leg and foot flexion" (McGrew, p. 102).

This behavior often occurred in combination with running. McGrew (1972) found that running movements sometimes graded into quick hop.

Laugh. "The characteristic sound is produced by a series of short, rapidly repeated, spasmodic, expiratory movements through the open mouth" (McGrew, p. 60).

In each of the groups only two or three of the children laughed to any extent. Laugh occurred when one child acted the class clown, feigning clumsiness or performing some ridiculous behavior. Some children also laughed when another child fell or engaged in object destruction, or after that individual had aggressed against another child and the other did not return the aggression. In such instances, laughter appeared to be a tension releasing mechanism in anxiety-provoking situations. Teasing laughter of the HA! HA! variety sometimes occurred and was easily distinguishable from the more spontaneous vocalization.

Fall. "The body suddenly and violently moves down from an upright position to a horizontal one, usually onto the ground" (McGrew, p. 97). Fall included voluntary as well as involuntary falling.

Fall occurred voluntarily in play; as when play shot in a game, or as what appeared to be an attention-getting device. One child in the newly-formed group often stumbled and fell, loudly banging against furniture and knocking over chairs. He often flung his body partly off balance to initiate the falling routine.

A behavior closely resembling a voluntary fall was the "slide" or "plop down." A child, usually at the end of a run, would reach his destination and either slide down on his side, or plop down on his knees or his buttocks on the floor.

Involuntary falling often occurred when a child was running across open floor space, or when locomoting with attention focused other than where he was going, as in fleeing or chasing another.

Wrestle. "Gross body movement by two or more chidren while grappled in physical contact" (McGrew, p. 105).

This behavior pattern would sometimes begin with all participants laughing and pulling toward one another. But very quickly the smiles might fade to puckers or frowns, and hits be exchanged. Efforts would then be made by the participants toward separation, with one child pushing, pulling, or swinging the other away from his body.

The general form of the thirteen social behaviors observed did not differ significantly from the descriptions of the motor patterns given by other workers. Nor were there great differences in these

behaviors as manifested by the two different groups studied. The major distinction between the behaviors as evidenced by the newly-formed group and the well-established class of pre-school children was the frequency of occurrence. Table 1 presents the overall mean frequencies of the behaviors per thirty-minute observation period for the two groups. In every case the newly-formed group was more active. For both groups the three most frequently occurring motor patterns of those noted in the study were walk, physical contact, and run. The three least frequent behaviors for the well-acquainted group were wrestle, push-pull, and object struggle, in that order; for the newly-formed group they were wrestle, object struggle, and laugh.

TABLE 1

COMPARISONS OF THE SOCIAL BEHAVIORS, OVERALL MEAN FREQUENCIES PER THIRTY-MINUTE OBSERVATION PERIOD FOR THE WELL-ACQUAINTED AND NEWLY-FORMED GROUPS--ACROSS EXPERIMENTAL CONDITIONS

Behavior Pattern	Well-Acquainted Group	Newly-Formed Group
Hit	0.44	6.86
Push-Pull	1.68	3.95
Object Destruction	2.07	5.95
Negative Expletive	2.38	3.91
Object Struggle	0.83	1.80
Hold-Out	0.83	1.37
Physical Contact	2.41	11.63
Walk	15.76	33.14
Run	2.96	7.91
Jump-Hop	1.89	2.29
Laugh	0.45	1.35
Fall	0.63	1.38
Wrestle	0.01	1.75

CHAPTER V

METHODOLOGY, EXPERIMENT I

Experimental Design

The research project was divided into two parts. In the first experiment, a well-established group of children was observed under normal spatial conditions, under reduced spatial conditions, and then again under conditions of spatial density to which they were accustomed.

The second experiment entailed placing a similar group of children, of equal number, most of whom were unacquainted with one another, through the same "uncrowded," "crowded," and then "uncrowded" again sequence.

Subjects

The group observed in the first part of this research included eleven nursery school children, five boys and six girls. (Hereafter referred to as Group I.) Their mean age was 53 months (range 45-59 months) at the beginning of the observations. Mean nursery school experience was 6.1 months (range 2-20 months). The subjects averaged 1 sibling (range 0-2). All children involved were English-speaking Caucasians. Seven of the eleven children came from the Class II socioeconomic strata, and the other four from Class III families (according to Hollingshead Index of Social Position, Hollingshead and Redlich, 1961). Their fathers' occupations included civil engineer, economist, salesman, policeman, university student, professor, and store manager, to name a few. The group evidenced no notable emotional

disturbances, no speech, sight, or hearing problems. All children had been certified by their pediatricians as physically suitable for normal group activities as of September 1, 1972. (See Table 2, for individual data.)

The chidren had three months experience with each other before the study began, and many had known each other much longer than this. Thus, relationships within the group were considered relatively stable.

Facilities

The facility used, Kindergarten A, was a private school run by a member of the Knoxville Pre-School Association.

The play room in which the children were observed was much like most, well-equipped pre-school facilities. It was 7.63 meters long, 4.6 meters wide, and 3 meters from floor to ceiling. At one end was a small, connecting bathroom, and built into the wall at the same end of the room was a sink and cabinets. The room was equipped with four small wooden tables, and usually from 13-16 small chairs. A large variety of toys, balls, dolls, puzzles, books, blocks, and arts and crafts supplies were available. A play kitchen and ironing board encompassed one corner of the room. There were approximately 22.0 square meters of open floor space. The room was well-lit with two large windows along one side, and six 150 watt ceiling lights. The temperature was held constant at 72° F. by central heating and air conditioning. (See Figure 1 for floor plan.)

Nursery Routine

The four year old children attended this school Monday, Wednesday, and Friday from September to June. They generally arrived with their

TABLE 2

DEMOGRAPHIC DATA ON GROUP I

Child	Sex	Age at Start of Study (mos.)	Number of Siblings	Pre-School Experience (months)	Social Class	Height (cm.)	Weight (kg.)
A	F	49	1	2	II	105	17.2
B	F	55	0	2	II	114	20.4
C	F	59	1	2	III	106	17.7
D	F	58	1	11	III	116	18.1
E	F	47	1	2	III	109	18.6
F	F	47	1	2	II	107	16.8
G	M	52	1	11	II	100	15.4
H	M	57	1	20	II	118	25.9
I	M	45	2	2	II	104	20.4
J	M	57	1	2	III	112	19.5
K	M	57	1	11	II	113	19.1

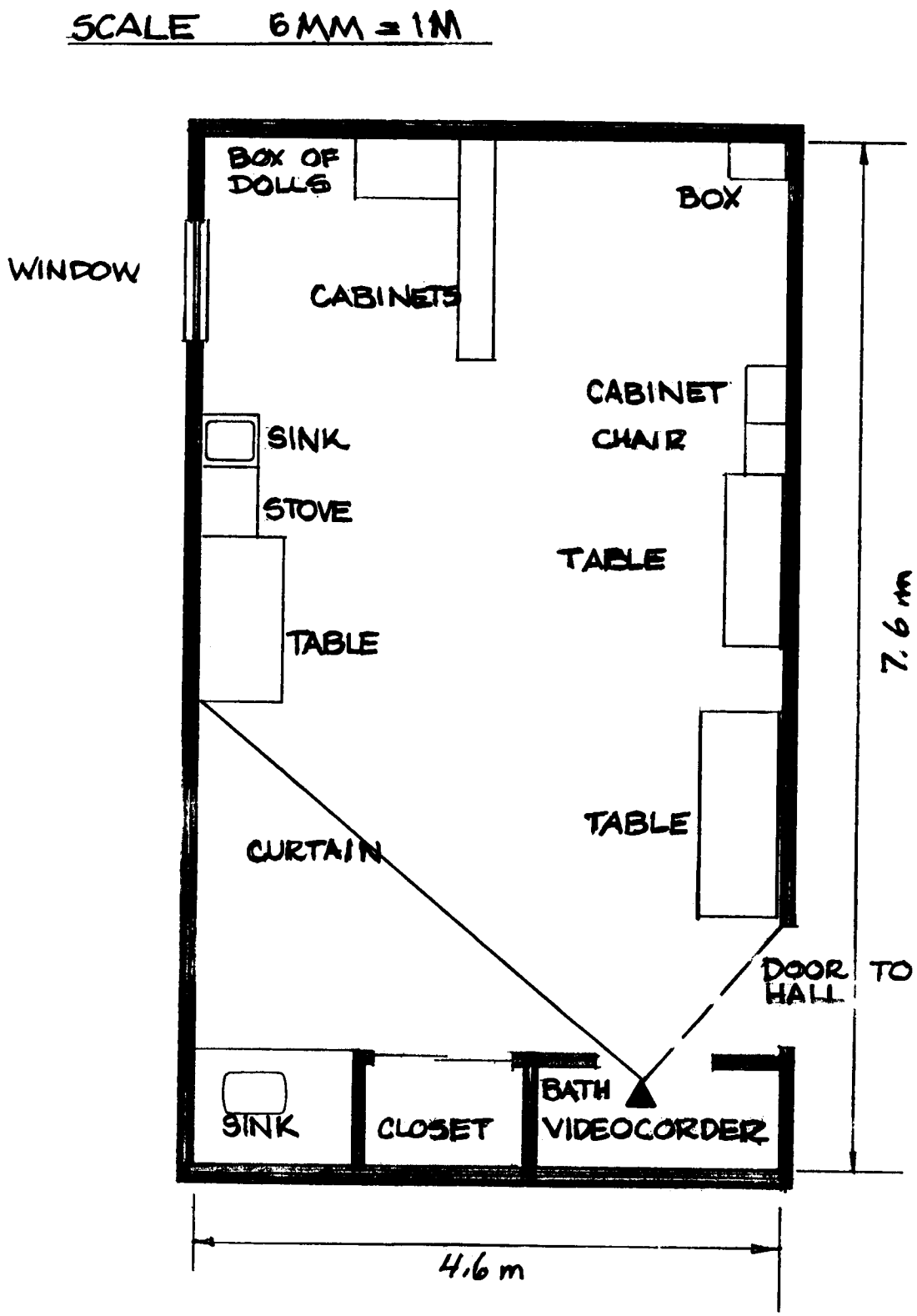


Figure 1. Floor plan of play room, Kindergarten A, normal spatial density conditions.

mothers between 8:30 and 9:00 A.M. From 9:00 to 9:30 the four year old classes usually engaged in some type of guided group activity. From 9:30 to 10:00 was a free-play period during which the children were allowed to play with the toys and equipment in the room with little direction or interference by the teacher. The 10:00 to 10:30 period began with punch and cookies, after which the children sat around as a group for show-and-tell, to sing songs, or to listen to the teacher read a story. From 10:30 to 11:15 the children played outside in a large playground unless there was inclement weather, in which case guided group activities continued. The mothers usually arrived from 11:15 to 11:30 to drive them home.

Observational Procedures

A Sony AV-3400 videorecorder and AVC-3400 videocamera with a Sony 12.5 mm wide angle lens was positioned in the bathroom which was connected to one end of the playroom. From this point, the camera was able to cover all but one corner of the room which was barred from use by a curtain, as illustrated in Figure 1. This equipment was set up before each observation period around 9:00 and left there until the children went out to play, so as to minimize their attention to it during the free play period. The door to the bathroom was left partly closed, and the equipment left running without attention to further attenuate its obtrusive effects. Because the recorder operated silently with no visible running parts, the children were unable to detect when it was on or off. After the initial novelty wore off, the children seemed to treat it as just another school fixture.

With regard to the observer's presence, the children had approximately three weeks' experience with him by the time the study began. By this time they had begun to pay him little overt attention. To further reduce his interactional influences, the observer did not initiate contact with any child. If a child initiated interaction with him, the observer would terminate it as quickly as possible, with a short, non-committal reply. Handled in this manner, such interactions caused negligible interruption in the child's behavior and occurred relatively infrequently.

The teacher was asked to remain seated along the side of the room during any free-play period which was under observation. She was instructed to keep her interactions with the children to a minimum, interfering only when it appeared that a child was or might be seriously hurt. Such instances did not occur often.

Experimental Procedures

The first stage was a habituation period. The experimenter sat on the sidelines and became acquainted with and observed the children for approximately three weeks before filming began. The camera was set up for two weeks before official recording started. The children were accustomed to university students observing them, and were told that the investigator was just another student there to learn about teaching kindergarten.

The first experimental condition consisted of audio-video tape recordings of the group on five successive school days. The observations were made from 9:30 to 10:00 A.M., during free-play period. This

"uncrowded" condition involved no major changes in the play room as the children were accustomed to it. A curtain was placed over one corner of the room, reducing the play area by approximately 2.75 square meters. However, previous observation had shown that this was the area in which the teacher kept her school supplies and personal belongings, and was not frequented by the children during free-play. This corner also included the sink which the children had explicit instructions not to use during this time.

Because some children were absent, this low spatial density situation averaged 3.00 square meters per child, or 2.60 square meters of open floor space per person.

The "crowded" or high spatial density condition lasted for six successive school days, and immediately followed the "uncrowded" period. A curtain was placed along the length of one side of the room, reducing the effective play area by about one-third. This allowed 2.0 square meters per person. Because all large toys and furniture were kept in their same relative positions, the available floor space was reduced by 63% to 1.0 square meters per child (see Figure 2).

The third stage of the first experiment involved returning the room size to its former dimensions of 3.00 square meters per subject for three successive play periods.

At the beginning of the study, the teacher ranked the members of this group on the several dimensions stated above. For each dimension the teacher was presented a line drawn on 8 1/2" by 11" plain, white paper. Along the vertical line were five descriptions, evenly spaced,

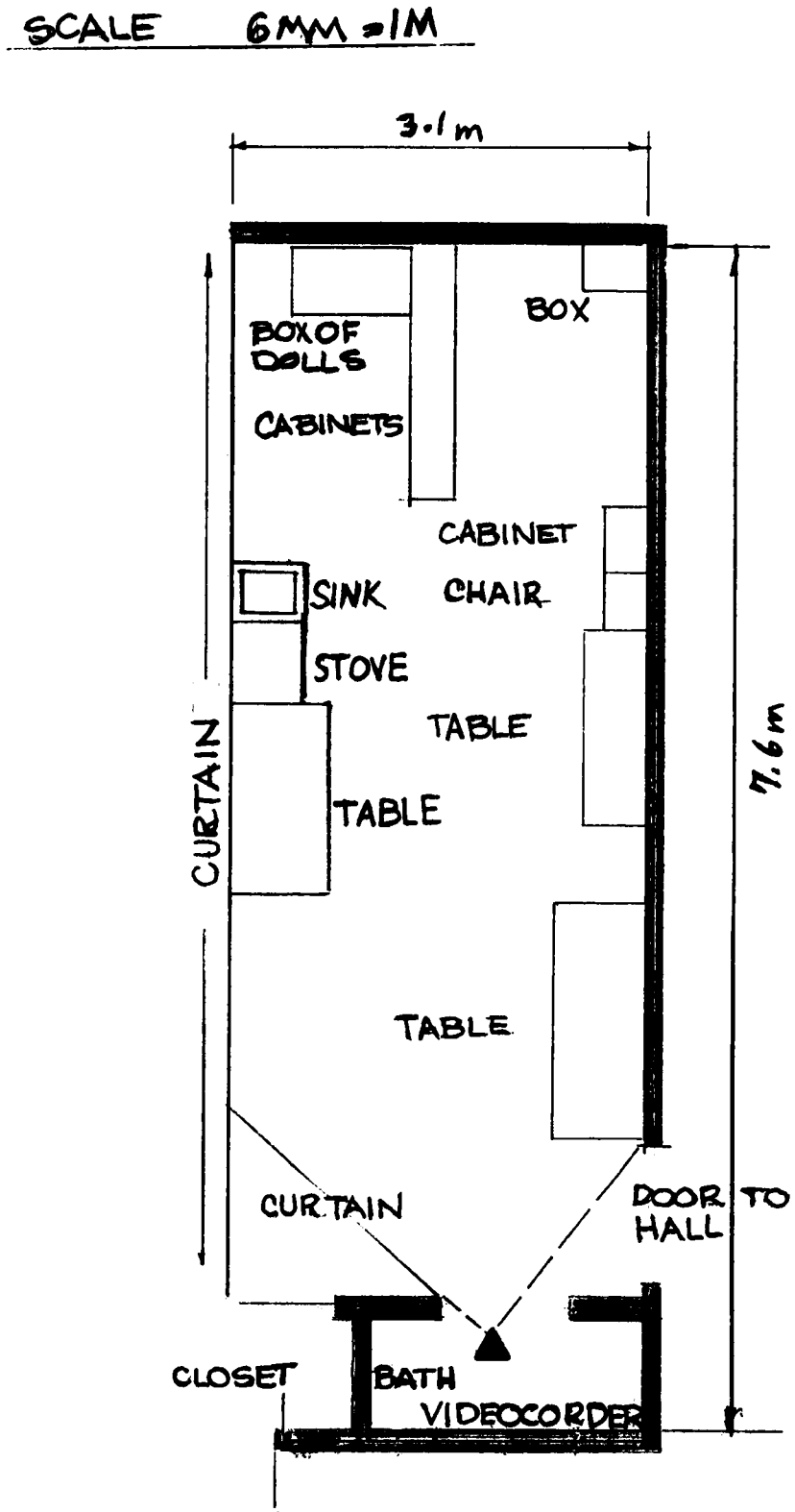


Figure 2. Floor plan of play room, Kindergarten A, high spatial density condition.

to be used as guidelines: For example, very dominant, somewhat dominant, average, somewhat subordinate, very subordinate. The teacher was instructed that the children's names need not be spaced evenly along the line, and that several might be placed close together or adjacent, if she wanted.

Peer ratings were taken after the observations were made on the final day of the experiment. Each of the children in Group I was asked individually, and in private, to name his three best friends in the group.

CHAPTER VI

RELIABILITY

The audio-video tapes of the fourteen thirty-minute free-play sessions of Group I formed the principal data base for this experiment. This technique of recording provided a method of continuous naturalistic observation of all subjects, and a permanent record of their motor and vocal behavior. The use of video recording was expected to yield higher reliabilities and less observer intrusion than note-taking or audio-recording by the observer.

A housewife was employed to view the tapes of Group I as a reliability check. All of the fourteen tapes were viewed in their entirety by her and the experimenter. In all cases both observers watched only one child at a time throughout the session. For the observers this procedure involved over 125 hours to code the thirteen social behaviors for the subjects of Group I.

The frequencies of the behaviors initiated by each child were recorded separately by the observers. A behavior recording sheet was utilized for this purpose. The tapes were viewed on a Sony 19 inch television monitor.

Before coding began, both observers viewed several practice tapes to familiarize themselves with the children and to practice recording the behaviors. The co-rater was unaware of the purposes of the study. She was merely told that the experimenter was interested in studying the play behavior of pre-school children.

The inter observer reliability for each of the behaviors was calculated as the number of agreements that a behavior occurred, divided by the number of agreements plus the number of disagreements. The reliability coefficients for each of the behavior categories recorded in this experiment are provided in Table 3. Inspection of the table indicates that all of the reliabilities exceeded 90% (Mean = .95, Range = .90-1.00). These figures argue for the clarity of the definitions and the efficacy of the observational techniques.

TABLE 3

INTER-OBSERVER RELIABILITY COEFFICIENTS, EXPERIMENT I

Behavior Category	Reliability Coefficients
Hit	.95
Push-Pull	.94
Object Destruction	.95
Negative Expletive	.95
Object Struggle	.98
Hold Out	.96
Physical Contact	.90
Walk	.96
Run	.93
Jump-Hop	.92
Laugh	.91
Fall	.95
Wrestle	1.00

CHAPTER VII

RESULTS OF EXPERIMENT I

Group Dominance Hierarchy

The dominance hierarchy for Group I was described separately for the first two experimental conditions in several ways. Too few struggles occurred in the repeated "uncrowded" condition to determine a rank order. The first method entailed ranking the nine subjects consistently present in this condition according to the total number of times he or she won object struggles during each period; the child with the most wins ranked at the top. (One female who was present was not included in the hierarchy as she engaged in no dominance struggles while in the class.) In cases of ties, the child who won over another was considered the higher in the rank order. This was termed the "win" hierarchy.

Simple number of wins seemed basically a measure of who was the strongest and most agonistic of the children. That is, the child who was most willing to fight for an object, who both tried to deny others use of such toys, and who prompted in others resistance to his use of those objects.

A more complete picture of the group dominance structure was obtained by taking a ratio of the number of times a subject won object struggles divided by the total number of times he was involved in struggles over objects. Such a system takes into consideration the number of times a subject lost as well as won these battles over

incentives. This was termed the "ratio" hierarchy. An advantage of such a measure is that it provides a more precise view of the hierarchical relationships within the group, by accounting for the subject who may not fight often, but may consistently win object struggles over certain group members, such that his status in the group is very high. The Spearman rank order correlation between these two measures was significant ($r_s = .90$, $p<.01$).

Coombs (1964) discussed another method by which the dominance relationships within a group, suggested by the winning and losing of object struggles, may be compared. As per Coombs, the wins and losses were converted to a (1,0) data matrix to test for transitivity. A "1" indicated that the subject in that row won over the subject at the head of the column over 0.5 of the time they engaged in object struggles. A "0" indicated who usually lost to whom. Dashes were entered into cells which did not contain data. (The number of object struggles won and lost for each subject upon which this and the other matrices are based are presented in Appendixes K-O.)

When object struggles alone were utilized in this analysis, too many cells in the matrix were left without data, such that a firm description of the relationships between the group members could not be drawn. Therefore, the experimenter included in the matrix instances in which one child appeared to be dominating another with respect to an object, but where no obvious struggle had taken place. Examples of such instances included one child taking an object from another who was obviously using it, without protest from the previous owner. Also

included were instances in which two children were moving toward or attempting to obtain an object, the winner being the child who obtained it without struggling.

The use of a matrix does not assume a linear rank order, as do the win and ratio measures. Further, it provides the most complete description of the relationships amongst all of the group members by taking into account the wins and losses between every possible pair.

Perusal of Figure 3 indicates that there were no intransitivities in the linear rank order; a perfect triangular pattern was achieved for these nine subjects in the low spatial density condition. The lack of inconsistencies in the win-loss matrix is what one might expect in a well acquainted group of children, where dominance relationships between members are established and rarely challenged. This matrix hierarchy correlated well with the win and ratio rank orders ($r = .63$, $p<.05$ and $r = .61$, $p<.05$, respectively).

The matrix indicates that overall the group structure was stable during this period. To examine the stability of the group structure on a day by day basis, each child was ranked daily on the basis of the number of times he won object struggles/the number of struggles in which he participated that day. The Kendall Coefficient of Concordance (W) provides a measure of the association amongst the daily ratio hierarchies within any density condition. For this low density condition, $W = .626$. The significance of this value may be tested by comparing it with the Chi-Square distribution ($X = 25.06$, $df = 8$, $p<.01$). These results indicate that the ratio hierarchies during condition A were substantially the same from day to day.

Subject	2	5	1	3	8	7	10	4	6	Rank
(M)2		1	1	1	1	1	1	1	1	1
(M)5	0		1	-	-	-	-	-	-	2
(M)1	0	0		1	1	1	1	1	1	3
(M)3	0	-	0		1	1	1	1	-	4
(F)8	0	-	0	0		1	1	-	-	5
(F)7	0	-	0	0	0		1	1	-	6
(F)10	0	-	0	0	0	0		1	-	7
(M)4	0	-	0	0	-	0	0		1	8
(F)6	0	-	0	-	-	-	-	0		9

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 3. Matrix hierarchy for the well-established group in low spatial density condition (A).

To further substantiate the use of object struggles as a valid descriptive measure of the group social structure, rankings on dominance, aggressiveness, sociability, friendliness, cooperativeness, intelligence, and activeness were obtained from the teacher. Sociometric peer ratings were also made. M. L. Northway (1960) has devised a method for analyzing such peer ratings. First choice is scored 5, second choice 3, and third choice 2.

Kendall Tau B correlation coefficients were calculated for the teacher's ranking in relation to one another and with respect to the win and matrix hierarchies of Group I in normal spatial conditions. Table 4 gives the probabilities associated with these correlation coefficients. Perusal of this table indicates that the teacher's rankings of the group on dominance, aggressiveness, sociability, and activity were all related significantly to one another as well as to both dominance hierarchies based on the winning and losing of object struggles. Furthermore, none of these several perspectives of the group dominance structure, were correlated with the teacher's rankings on intelligence, friendliness, or cooperativeness. As might be expected, however, these last three characteristics were significantly interrelated to one another.

These results are similar to those reported by McGrew (1972) who found high correlations between teacher rankings of aggressiveness, sociability, and activity. It seems that not only is there a connection in the teacher's mind that the most dominant child is also the most active, sociable, and aggressive, but that these impressions are

TABLE 4

KENDALL TAU B CORRELATIONS AMONGST TEACHER RANKINGS AND DOMINANCE HIERARCHIES (CONDITION A), WELL-ESTABLISHED GROUP

	Dominance Rank	Aggressiveness Rank	Sociability Rank	Intelligence Rank	Activity Rank	Friendliness Rank	Cooperativeness Rank	Win Hierarchy	Matrix Hierarchy
Dominance Rank	---	.78***	.56**	.20	.56**	.12	.09	.55**	.52**
Aggressiveness Rank		---	.49**	.05	.56**	.09	.01	.64***	.42**
Sociability Rank			---	.34	.78***	.34	.38	.42**	.46**
Intelligence Rank				---	.20	.41**	.60***	.06	.11
Activity Rank					---	.27	.30	.55**	.51**
Friendliness Rank						---	.45**	.28	.02
Cooperativeness Rank							---	.02	.06

*p<.1.

**p<.05.

***p<.01.

highly related to an objective measure of such dominance--the winning and losing of object struggles with peers.

The peer ratings taken at the end of the study were also compared to the win and matrix hierarchies. The probabilities associated with the Kendall Tau B correlation coefficients indicated no relationship of any significance between these variables. It is of note that when the sociometric peer ratings were compared to the teacher's rankings, the only significant correlations occurred with friendliness ($p = .02$) and cooperativeness ($p = .06$). These results indicated that the children in this group chose their friends on the basis of these latter two characteristics, and that the aggressiveness and activity associated with dominance does not seem to "make friends," although it may "influence people."

The teacher's rankings, peer ratings, win hierarchy, and matrix hierarchy were examined in relation to four demographic variables: weight, height, age, and degree of nursery school experience. Table 5 illustrates that there were few significant relationships among these variables. Height was associated with weight and peer rank. Age was related to dominance, aggressiveness, sociability, and intelligence. Nursery school experience correlated highly with cooperativeness.

These results are confirmed by other workers. McGrew (1972) found relationships between weight and several variables--aggressiveness, activity, time spent in nursery school, age, and dominance. Thompson (1967) reported that the most dominant boys were the two eldest children in the group. Parten (1933) noted that leaders were likely to be older, more socially inclined, and more intelligent than non-leaders.

TABLE 5

KENDALL TAU B CORRELATIONS AMONGST A NUMBER OF DEMOGRAPHIC VARIABLES, TEACHER RANKINGS, PEER RANK, WIN AND MATRIX HIERARCHIES (CONDITION A) FOR THE WELL-ESTABLISHED GROUP

	Weight	Height	Age	Nursery Experience	Dominance Rank	Aggressiveness Rank	Sociability Rank	Intelligence Rank	Activity Rank	Friendliness Rank	Cooperativeness Rank	Peer Rank	Win Hierarchy	Matrix Hierarchy
Weight	---	.50**	.00	.00	.03	.11	.03	.03	.25	.03	.07	.29	.08	.17
Height		---	.36	.34	.14	.07	.14	.18	.14	.18	.18	.44**	.13	.17
Age			---	.35	.43**	.47**	.50**	.43**	.35	.01	.24	.28	.16	.02
Nursery Experience				---	.07	.07	.36	.36	.36	.41	.60***	.31	.37	.14

**p<.05.

***p<.01.

Turning to the high spatial density condition, it must first be explained that two of the girls were absent most of this period, and another girl who had been ill all of the first condition returned to class. Win, ratio, and matrix hierarchies were constructed for the nine Ss consistently present in the condition of reduced space. The rank orders were highly correlated. The Spearman Rank Order correlation between win and ratio hierarchies was .87, $p<.01$; between win and matrix .80, $p<.01$.; and between ratio and matrix hierarchies .80, $p<.01$.

When the several hierarchies for the two different conditions were compared with each other, there was fairly consistent indication that the rank order of the group had changed. Based on the eight Ss present in both conditions, the Spearman Rank Order correlation between win rankings was .21, p = n.s.; between ratio hierarchies, .04, p = n.s.; and between matrices, .04, p = n.s.

Inspection of the matrix hierarchies for the two experimental conditions revealed that not only had the group social structure changed, but it had become less stable in the high density condition. Figure 4 illustrates that there were several intransitivities in the rank order.

Coombs (1964) presented a formula given by Kendall for computing the total number of intransitivities in a matrix of this sort. Kendall defined an intransitivity as a circular triad, and the number of such inconsistencies in the linear order, d, is obtained by the expression:

$$d = 1/12\ n(n-1)(2n-1) - 1/2\Sigma_j aj^2$$

where aj is the sum for row j. The total number of intransitivities

Subject	2	3	5	4	1	8	10	9	7	Rank
(M)2		1	0	1	1	1	1	1	1	1
(M)3	0		1	0	1	1	1	1	-	2
(M)5	1	0		1	0	-	-	-	-	3
(M)4	0	1	0		-	1	1	-	1	4
(M)1	0	0	1	-		-	1	-	-	5
(F)8	0	0	-	0	-		1	1	-	6
(F)10	0	0	-	0	0	0		1	-	7
(F)9	0	0	-	-	-	0	0		-	8
(F)7	0	-	-	0	-	-	-	-		9

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 4. Matrix hierarchy for the well-established group in high spatial density condition (B).

for the high spatial density condition, Group I, was 4. The Kendall Coefficient of Concordance also indicates that from day to day during this period, the group dominance structure was somewhat unstable ($W = 0.30$, $x^2 = 14.40$, $df = 8$, p = n.s.).

Further evidence that the group dominance structure had been altered comes from comparisons between the teacher's rankings and the two dominance orders as seen in Table 6. What were fairly high Kendall Tau B correlations between dominance, aggressiveness, sociability, and activity, and the win and matrix hierarchies in the 100% space condition, were now all non-significant. In fact, out of all the variables ranked, only age was still related to these two dominance measures. The teacher had been asked to rank the children at the beginning of the study, and it is reasonable that her impressions of the group dominance structure closely approximated the situation before the experimental manipulation.

The two girls who left at the end of the low spatial density period were at the bottom of the hierarchy, and the female subject who entered at the beginning of the second period established herself near the bottom of the rank order. Thus, the change in relationships between those eight who consistently attended seems minimally affected by these changes in group composition.

The Effects of Altered Space on the Social Behaviors

This researcher encountered several problems in the analysis of the changes in frequency of the various social behaviors over experimental conditions. A number of the assumptions of the appropriate

TABLE 6

KENDALL TAU B CORRELATIONS BETWEEN TEACHER RANKINGS AND DOMINANCE HIERARCHIES FOR WELL-ESTABLISHED GROUP, CONDITION OF REDUCED SPACE

	Win Hierarchy		Matrix Hierarchy	
	Tau B	p	Tau B	p
Dominance Rank	0.16	.53	0.22	.40
Aggressiveness Rank	0.05	.83	0.11	.67
Sociability Rank	0.05	.83	0.11	.67
Activity Rank	0.27	.29	0.11	.67

parametric statistical procedures, the F and t tests, were not met by the data. It could be argued, as did Loo (1972), that the social behaviors of the group members were interdependent. Further, the frequency distributions of the behaviors were generally poisson in form.

Rather than violate these assumptions, the experimenter first turned to non-parametric procedures which do not require that these assumptions be met with the same stringency, or at all (Siegel, 1956). But because there were unequal numbers of observations in the cells, due to subject absences, only a small proportion of the data collected could be utilized in the analysis. Regardless, the Friedman Two-Way Analysis of Variance was used to test for overall significance amongst the three density conditions for each group, and the Wilcoxon Matched-Pairs Signed-Ranks Test provided information as to the location of the significant relationships. These findings are presented in Appendixes A-H for the interested reader.

Upon reconsideration, emphasis was placed upon analysis of the data by parametric methods. Presenting both analyses would have been redundant and difficult to interpret for both writer and reader. With regard to the assumptions mentioned above, Young and Veldman (1965) stated that "even considerable departures from normality or from homogeniety of variance have relatively little influence upon these tests" (referring to the F and t tests). Furthermore, the parametric tests are more familiar to most readers. Finally, this was an exploratory study. As such, its aims were to maximize the use of the data, and

to seek for indications of the effects of altered space and group instability on social interaction. The statistics were viewed only as a tool toward this end.

In an effort to make greater use of the data obtained, the total frequency of each behavior by period and by subject was weighted on the basis of five days. Such a procedure equalized the amount of data upon which the means were based so as to make comparisons possible. A One-Way Analysis of Variance with repeated measures on eight subjects was used to analyze the square roots of these means. Square roots were taken because the within cell distributions were Poisson in form, and a square root transformation tends to make the variance homogeneous (Winer, 1962).

The weighted group means for each behavior by condition and the probabilities associated with the F values for each can be seen in Table 7. The results were very similar to those obtained using more conservative statistical procedures. For a few of the dependent variables the parametric tests found a significant difference, where the nonparametrics did not. In every case, however, this was due to the fact that more data were included in the former procedures. It must be remembered that only the first two observation sessions for each condition were considered in the nonparametric analysis.

In the present instance all of the agonistic behaviors, except negative expletive, differed significantly over the three density conditions, and negative expletive closely approached the 0.05 level of significance as it had done previously. A review of Figure 5 will

TABLE 7

COMPARISONS OF SOCIAL BEHAVIORS, GROUP MEANS OF WEIGHTED TOTALS FOR GROUP I (8Ss), FIRST FIVE THIRTY-MINUTE OBSERVATION PERIODS UNDER EACH SPATIAL DENSITY CONDITION

Behavior Pattern	LOW (IA)		HIGH (IB)		LOW (IC)		F*	p
	Mean	SD	Mean	SD	Mean	SD		
Hit	2.11	1.53	3.12	1.35	0.39	1.11	8.611*	.006
Push-Pull	1.53	1.16	2.84	1.55	0.66	0.95	5.273	.038
Object Destruction	2.11	2.20	3.14	1.60	0.95	1.80	4.623	.056
Negative Expletive	2.46	1.72	3.06	1.52	1.63	1.51	3.277	.132
Object Struggle	2.86	0.84	1.84	0.97	0.78	1.19	8.618	.006
Hold Out	3.43	0.96	2.70	0.45	1.59	1.44	6.854	.016
Physical Contact	5.01	1.06	5.38	0.70	2.78	2.13	7.583	.012
Walk	12.81	1.89	11.24	2.07	9.16	3.43	3.876	.090
Run	4.81	1.09	4.57	2.74	5.23	3.47	0.218	n.s.
Jump-Hop	4.22	1.92	4.78	3.16	2.65	2.58	2.105	n.s.
Laugh	2.36	1.78	1.98	1.34	1.35	1.89	1.368	n.s.
Fall	2.75	1.21	2.44	1.48	1.54	1.50	4.977	.044
Wrestle	0.00	0.00	0.40	0.56	0.44	0.85	1.141	n.s.

*One-Way Analysis of Variance; p is for a two-tailed test; df = 2/14.

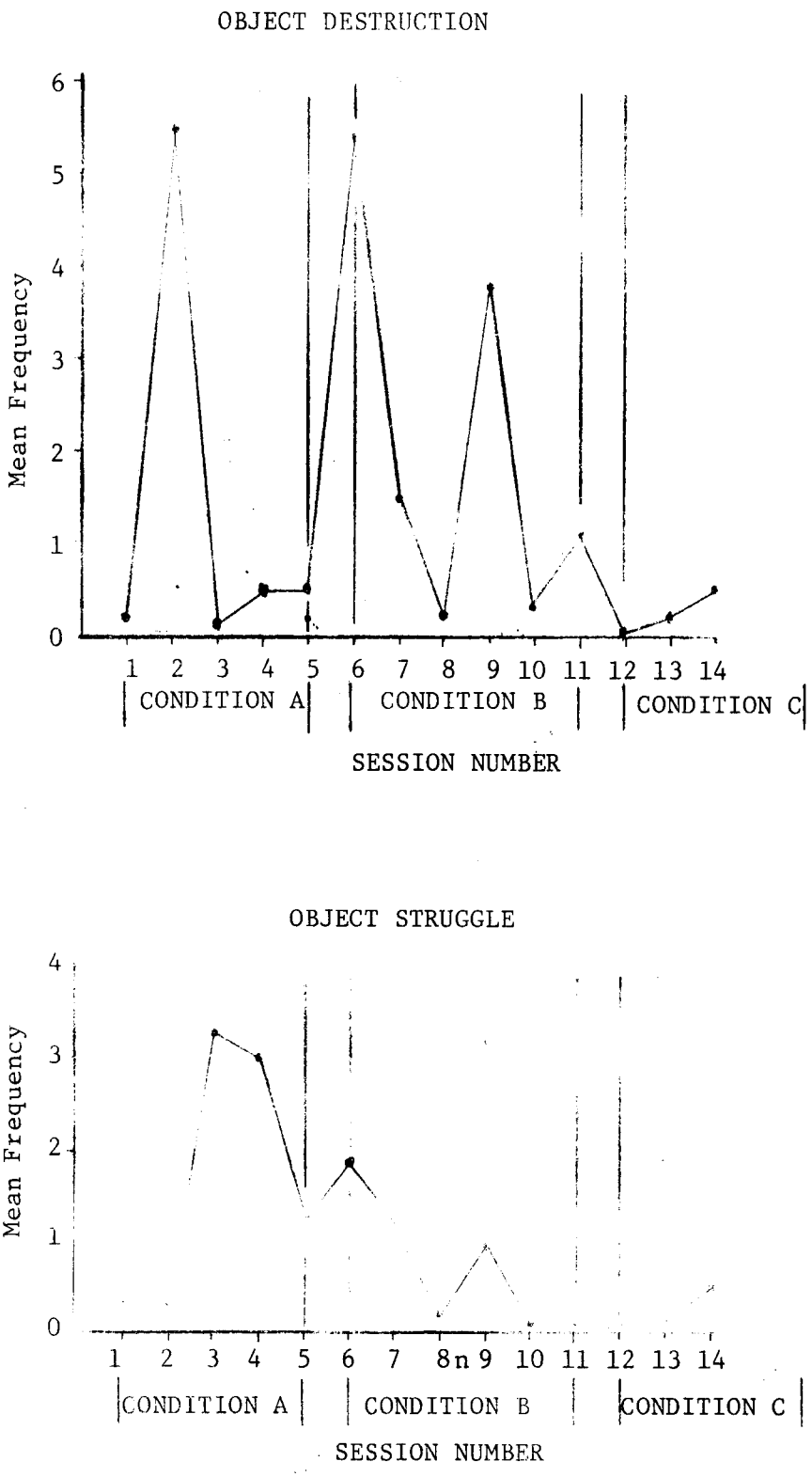
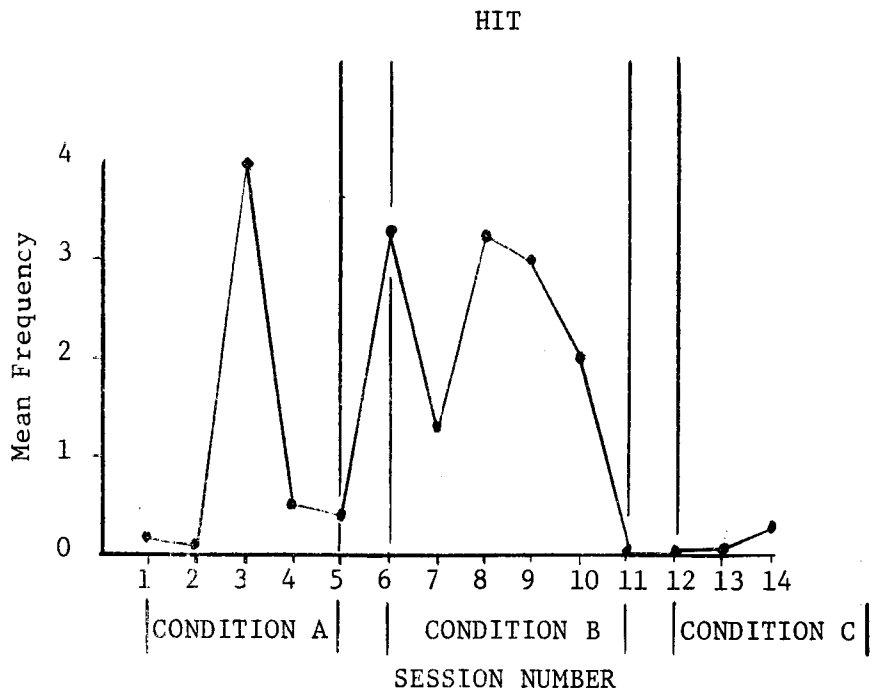


Figure 5. Mean frequencies per observation session for the agonistic behaviors evidenced by Group I.



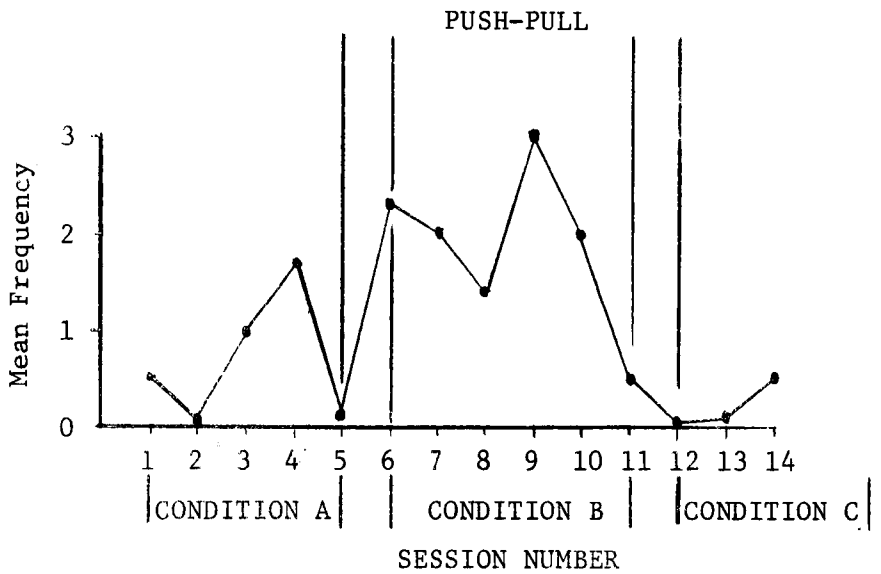


Figure 5. (continued).

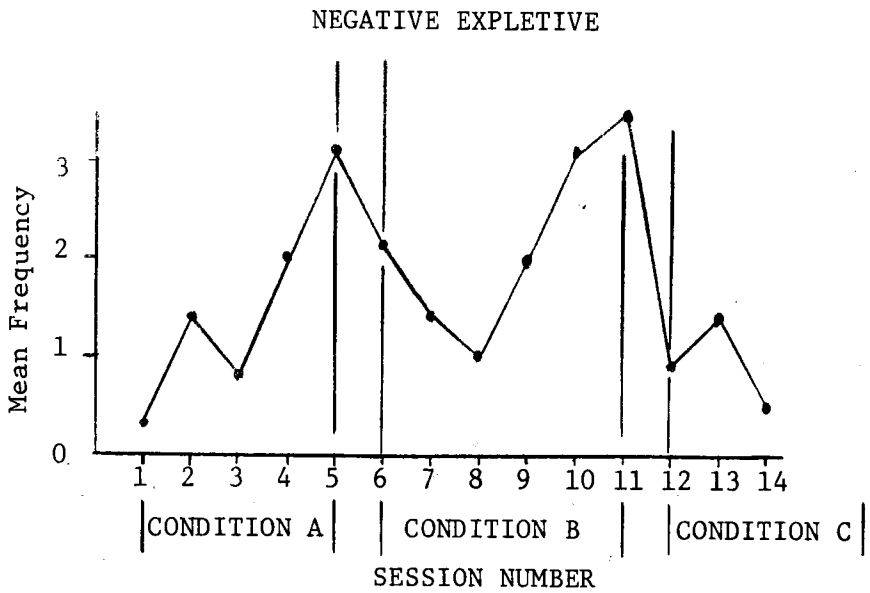


Figure 5. (Continued).

show that the mean number of hits were very high during sessions 8, 9, and 10. These values were accounted for only in the parametric test, which explains the discrepancy between the two results.

All three of the non-agonistic motor patterns were significantly different when all the data were utilized, whereas walk was not before. Referral to Figure 6 will suffice to show the reader that walk increased significantly during sessions 3-5 of condition A, which was not reflected when only two days were noted. The quasi-agonistic behaviors were relatively unaffected by spatial manipulations, with the exception of Fall, the high means of which on sessions 3, 4, 8, and 10 were not considered in the nonparametric analysis. (See Figure 7.)

Condition by condition comparisons were made to further specify the direction and location of the significant changes in frequencies of the behaviors. Tables 8, 9, and 10 present paired t-test comparisons for conditions A vs. B, B vs. C, and A vs. C. Of the agonistic behaviors, hit and push-pull increased from condition A to B, and then decreased significantly from B to C. Object destruction and negative expletive followed a similar pattern, although the only statistically significant change occurred from the high spatial density condition (B) to the repeated low density condition (C). Object struggles decreased significantly throughout the experiment.

In general the non-agonistic behaviors decreased in frequency over conditions. Hold out decreased significantly and walk showed a trend toward reduced frequencies in condition B, while both motor patterns continued this pattern during condition C. There was no

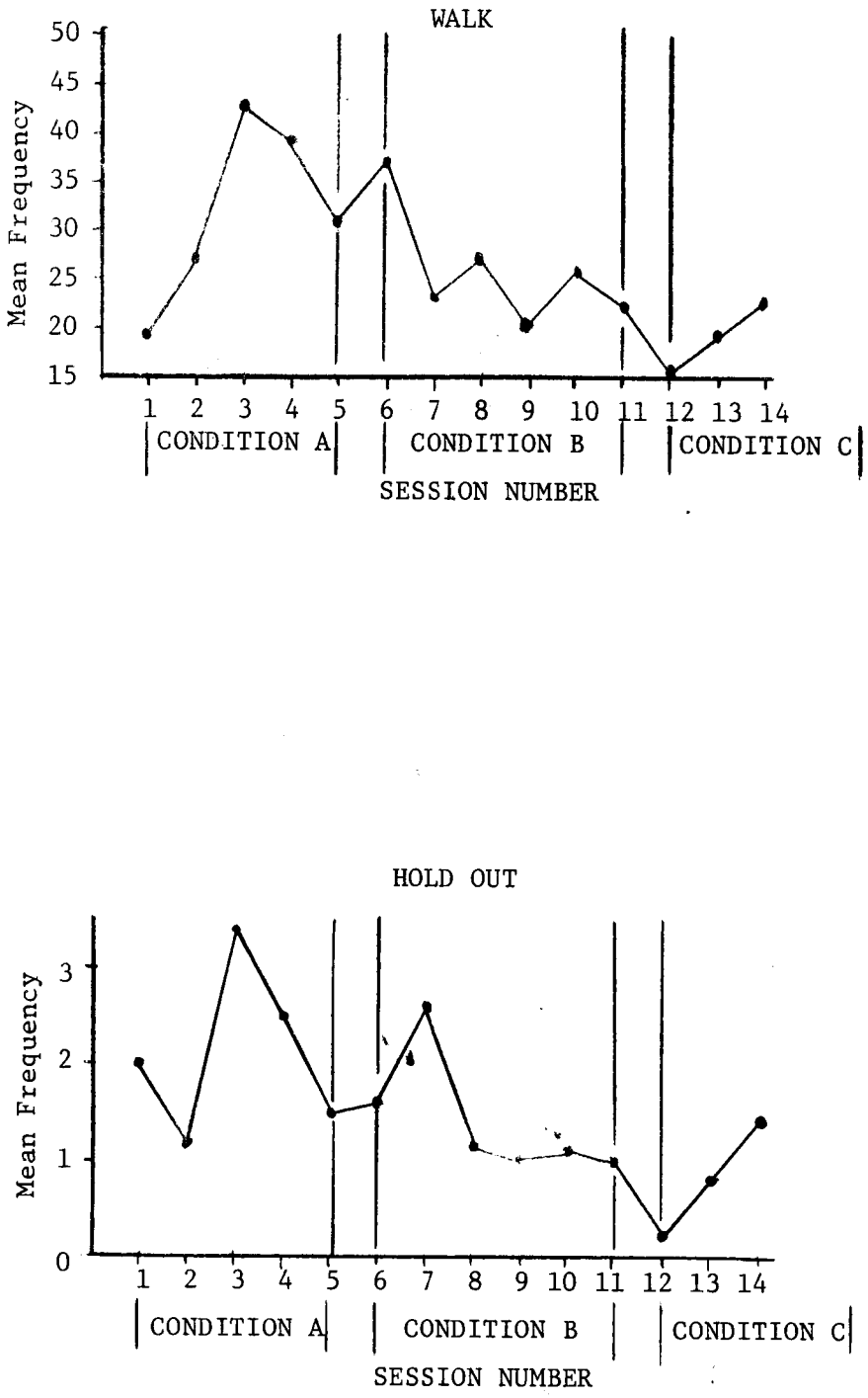


Figure 6. Mean frequencies per observation session for the non-agonistic behaviors evidenced by Group I.

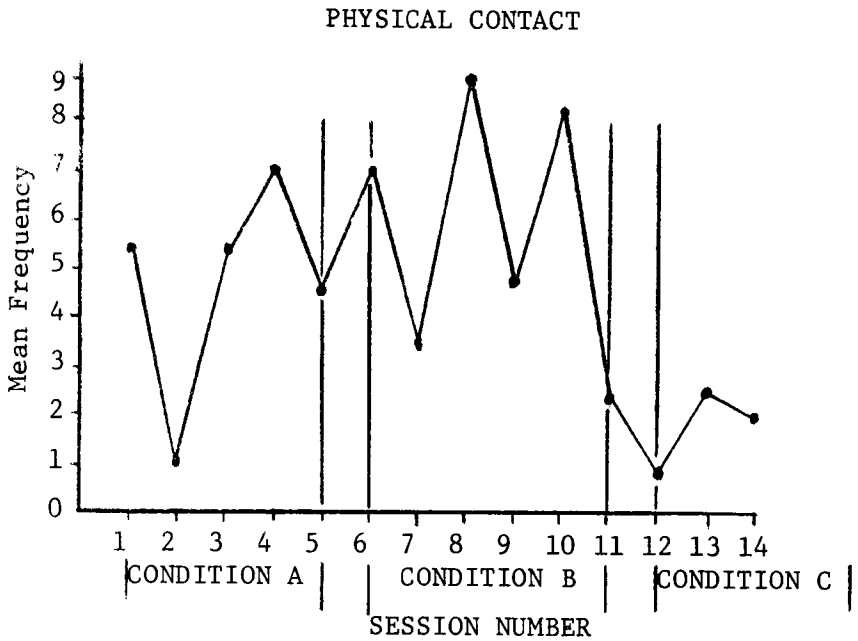


Figure 6. (continued).

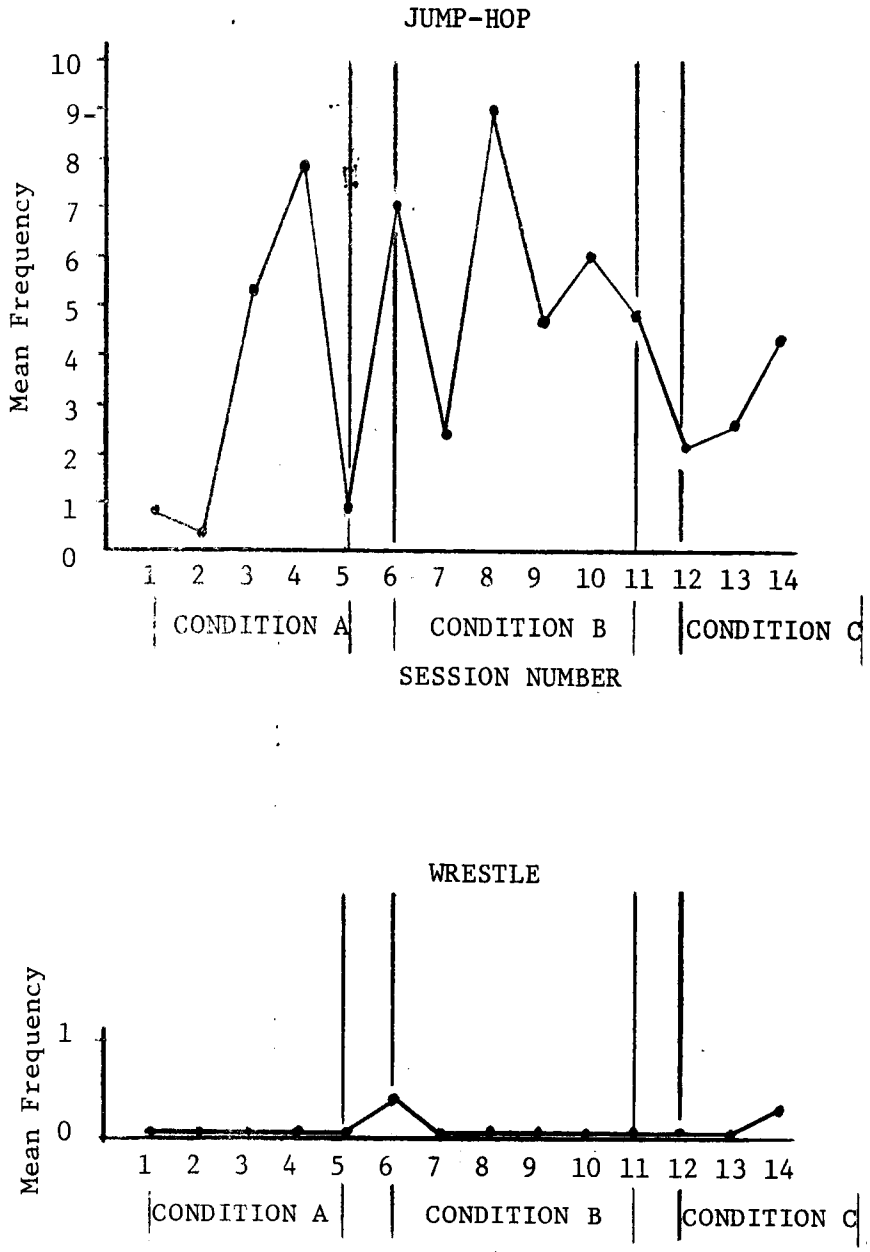
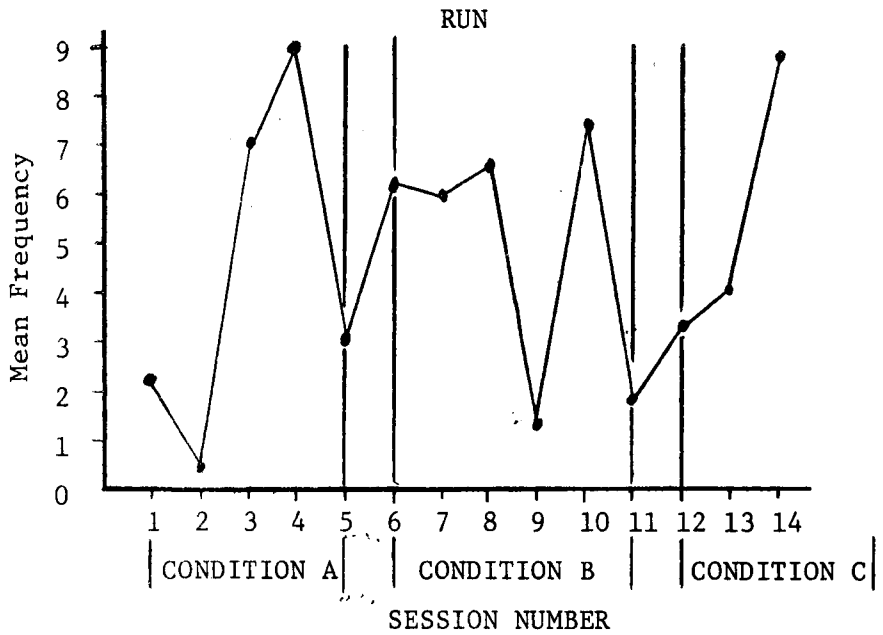


Figure 7. Mean frequencies per observation session for the quasi-agonistic behaviors evidenced by Group I.



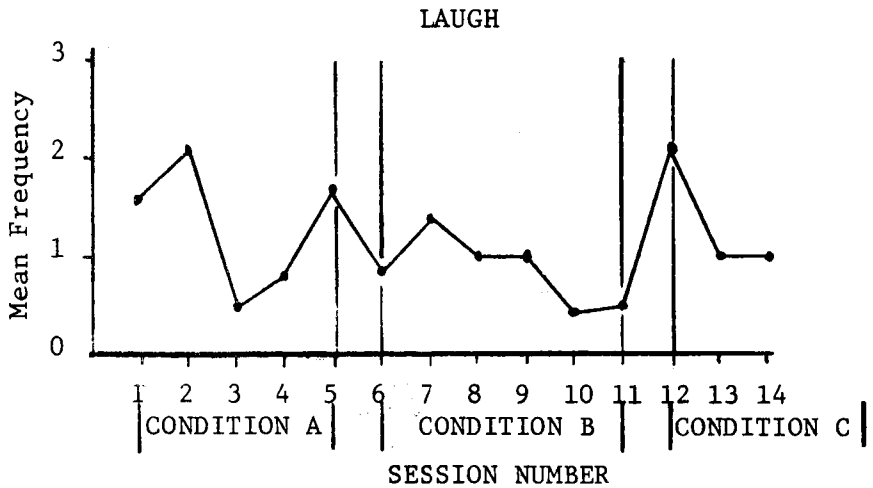


Figure 7. (continued).

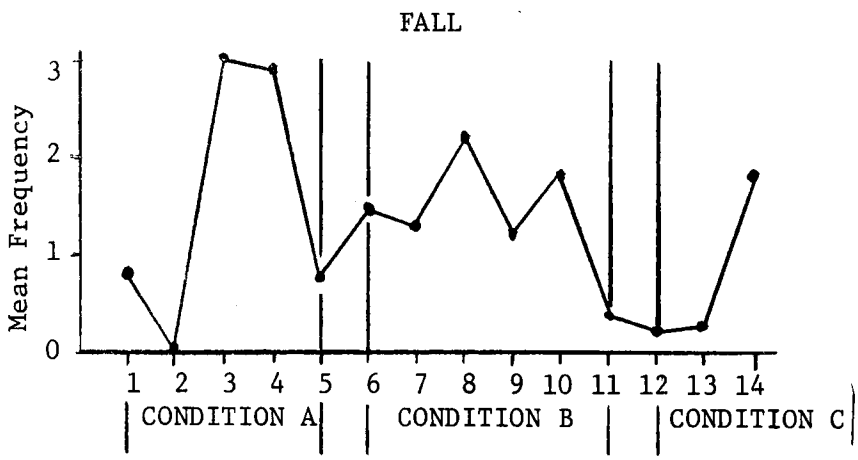


Figure 7. (continued).

TABLE 8

COMPARISONS OF THE SOCIAL BEHAVIORS, PAIRED T TESTS ON WEIGHTED MEANS FOR GROUP I (8Ss) IN LOW SPATIAL DENSITY (IA) VERSUS HIGH SPATIAL DENSITY (IB) CONDITIONS

Behavior Pattern	t*	p
Hit	1.70	n.s.
Push-Pull	2.17	.060
Object Destruction	1.20	n.s.
Negative Expletive	1.22	n.s.
Object Struggle	2.70	.030
Hold Out	2.12	.070
Physical Contact	1.28	n.s.
Walk	1.58	n.s.
Run	0.32	n.s.
Jump-Hop	0.55	n.s.
Laugh	0.76	n.s.
Fall	0.94	n.s.
Wrestle	2.01	.080

*Student's t-test, p is for a two-tailed test, df = 7.

TABLE 9

COMPARISONS OF THE SOCIAL BEHAVIORS, PAIRED T TESTS ON WEIGHTED MEANS FOR GROUP I (8Ss) IN HIGH (IB) AND THEN LOW (IC) SPATIAL DENSITY CONDITIONS

Behavior Pattern	t*	p
Hit	5.12	.001
Push-Pull	2.89	.02
Object Destruction	4.75	.002
Negative Expletive	3.57	.008
Object Struggle	2.25	.05
Hold Out	2.05	.08
Physical Contact	3.04	.02
Walk	1.68	.06
Run	0.64	n.s.
Jump-Hop	2.06	.08
Laugh	0.94	n.s.
Fall	1.70	n.s.
Wrestle	0.09	n.s.

*Student's t-test, p is for a two-tailed test, df = 7.

TABLE 10

COMPARISONS OF THE SOCIAL BEHAVIORS, PAIRED T TESTS ON WEIGHTED MEANS FOR GROUP I (8Ss) IN BOTH LOW SPATIAL DENSITY CONDITIONS (IA AND IC)

Behavior Pattern	t*	p
Hit	2.07	.06
Push-Pull	1.31	n.s.
Object Destruction	1.48	n.s.
Negative Expletive	1.13	n.s.
Object Struggle	3.33	.01
Hold Out	3.15	.01
Physical Contact	2.57	.02
Walk	2.24	.06
Run	0.35	n.s.
Jump-Hop	1.34	n.s.
Laugh	1.50	n.s.
Fall	4.12	.04
Wrestle	1.46	n.s.

Student's t-test, p is for a two-tailed test, df = 7.

significant difference in the occurrence of physical contacts between the children over the first two conditions, but the frequency of this behavior also dropped off in condition C (see Figure 6, page 71).

Fall was the only rough and tumble play behavior to reach overall significance; it followed the trend of the non-agonistic motor patterns which was to decrease over the three conditions.

CHAPTER VIII

DISCUSSION OF EXPERIMENT I

The present experiment demonstrated that the amount of space provided to a well-acquainted group of pre-school children during free-play is one important factor influencing both the quantity and quality of their social behavior. The frequency of all of the agonistic behaviors except object struggle increased, as expected, when the children were placed in conditions of reduced space. And the non-agonistic motor patterns were reduced during high density circumstances.

These results are supported by Hutt and Vaizey (1966) who manipulated social density, and W. C. McGrew (1972) who found that when space was reduced for his intact group, agonistic motor patterns increased in frequency and non-agonistic behaviors decreased.

Loo (1972) noted fewer "aggressive" behaviors under high spatial density conditions, as well as less social interaction and more time spent in solitary play. However, his "aggressive" category was much more broadly defined than were the motor patterns observed in this research project, as evidenced by his rather lower reliability coefficient of .54.

Even more dramatic changes than those noted above occurred when spatial density conditions were returned to normal, an experimental manipulation other experimenters did not include. All of the agonistic behaviors decreased significantly over the two previous conditions, as did the non-agonistic patterns, and all of the

quasi-agonistic category. The decrease in agonistic behaviors is in line with theoretical expectations, but the decrease in positive social interactions as well is difficult to explain. One interpretation may be that the negative effects of high density may have carried over for a period into the third condition. Figure 6, page 71, indicates that the frequencies of these social behaviors were generally on the rise, although there are too few observations to make any firm predictions.

This experiment was not wholly successful. It was designed to test a group of children with a well-established social structure in low versus high spatial density conditions. It was not expected that the rank order of the subjects would change as a result of the experimental manipulations (Alexander and Roth, 1971; Sommer, 1969). Given that the dominance relationships between group members under condition B were unstable, the changes in frequencies of various social behaviors cannot be clearly attributed to this factor or to higher spatial density. Nor is it possible to say whether the instability occurred first, followed by the increased agonistic and reduced non-agonistic behaviors, or that the increased agonistic motor patterns and decreased positive social interaction resulted in a disruption of the group social structure.

In addition, the group dominance structure during condition C could not be determined, and the experimenter cannot be sure how the stability or instability of the group may have affected the significant decreases in social behaviors which resulted when the children were returned to play in a room of normal dimensions.

CHAPTER IX

METHODOLOGY, EXPERIMENT II

In the beginning stages of this research effort, the investigator expected to continue the second half of the experiment at the same facility. A group of strangers was to be formed by introducing children from other classes to some of the subjects who had already participated. However, the experimenter was asked by the director of the school not to pursue the second part of the study because certain of the parents complained about their children having to play in "crowded" circumstances. Another facility was therefore located.

Subjects

The group formed for the second half of this study included nine four-year-olds, five boys and four girls. Nine children were chosen because the average number of subjects present during the first experiment was 8.5.

The subjects came from two nursery schools. Three children were chosen from the class of four-year-olds at Kindergarten B. The six other children were members of two classes of four and five-year-olds at Kindergarten C. Three subjects came from each class which had had no contact with the triad members from the other classes.

Prior to the actual study, the investigator spent 2-3 weeks, 12-15 hours per group, becoming acquainted with and observing the children in their own classes. Those subjects chosen to participate were closely matched with Group I in terms of frequency of their

agonistic, quasi-agonistic, and non-agonistic behaviors under normal spatial density conditions, as well as on the basis of demographic data. Table 11 illustrates that there were no significant differences in the frequencies of the social behaviors observed between the two groups when they played in familiar surroundings, with peers they were accustomed to, and in normal spatial density conditions.

The mean age of Group II was 54.4 months (range 59-60 months) at the beginning of the study. The subjects averaged .88 siblings (range 0-2). The mean nursery school experience was 14.8 months (range 12-18 months). Five of the children came from the Class II socioeconomic level, and four from Class III strata. Again all children were English-speaking Caucasians. Recent examinations by their pediatricians indicated that the children evidenced no speech, sight, hearing or emotional difficulties, and all were certified physically capable of engaging in normal play activities. (See Table 12 for individual demographic data.)

The only instructions concerning the study given the subjects was that if they wanted they could accompany the researcher to another school to play for a while with a group of children their own age. This was reinforced by their teachers, but no child was forced to come. Although one boy was apprehensive during the first session, thereafter all children appeared to view it as a special outing and were very eager to participate. Written permission to take part in the study was obtained from both the childrens' parents and the teachers.

TABLE 11

COMPARISONS OF SOCIAL BEHAVIORS, RANK TOTALS FOR THE FIRST TWO THIRTY-MINUTE OBSERVATION PERIODS FOR THE WELL-ESTABLISHED GROUP (10Ss) UNDER NORMAL SPATIAL DENSITY CONDITIONS VS. THE MEMBERS OF THE NEWLY-FORMED GROUP (9Ss) IN THEIR OWN CLASSROOMS UNDER NORMAL SPATIAL CONDITIONS

Behavior Pattern	Group I (Rank Totals)	Group II (Rank Totals)	U*	p
Hit	106.0	84.0	51.0	n.s.
Push-Pull	101.0	89.0	46.0	n.s.
Object Destruction	103.0	87.0	48.0	n.s.
Negative Expletive	96.5	93.5	41.5	n.s.
Object Struggle	113.0	77.0	58.0	n.s.
Hold Out	129.0	61.0	74.0	n.s.
Physical Contact	83.5	106.5	28.5	n.s.
Walk	100.5	89.5	45.5	n.s.
Run	101.0	89.0	46.0	n.s.
Jump-Hop	115.0	75.0	60.0	n.s.
Laugh	104.0	86.0	49.0	n.s.
Fall	122.5	67.5	67.5	n.s.
Wrestle	85.0	105.0	30.0	n.s.

*Mann-Whitney U Test, N1 = 8, N2 = 9.

TABLE 12

DEMOGRAPHIC DATA ON GROUP II

Child	Sex	Age at Start of Study (mos.)	Number of Siblings	Pre-School Experience (months)	Social Class	Height (cm.)	Weight (kg.)
12	F	59	1	16	III	103	16.3
13	F	51	0	14	II	107	19.1
14	F	52	2	12	II	102	14.5
15	F	50	1	18	II	100	15.9
16	M	56	1	16	III	116	23.1
17	M	60	1	16	III	110	18.1
18	M	55	0	13	II	114	20.4
19	M	58	1	15	III	109	18.6
20	M	49	1	13	III	111	19.5

Facilities

The facility utilized for this experiment was Kindergarten B. The play room in which the children were observed was similar to that employed in the first part of this study. It was 8.6 meters long, 4.0 meters wide, and 3.2 meters high. It too had a number of toys and games. The room was well-lit and had about 30 square meters of open floor space. The temperature in the room was controlled by thermostat, and was set at 72 degrees farenheit. (See Figure 8 for floor plan.)

Nursery Routine

This kindergarten was run on the same basic format as that of Kindergarten A, except that classes met five days a week, Monday through Friday. Planned group activities were interspersed with free-play from about 8:30 to 11:30 A.M. This schedule was flexible enough that the playroom could be made available to the researcher from 9:00 to 10:00 each day.

Observational Procedures

The Sony audio-videorecorder was placed at one end of the large play room, and the children were restricted to a 11.3 by 4.3 meter area at the other end. (See Figure 8.) With the wide angle lens, the entire play area could be observed. The camera was set up about one-half hour before the group was assembled. The children from Kindergarten C were transported in the experimenter's car to Kindergarten B by 9:30 A.M., and recording was begun as soon as all the children had entered the play area. At 10:00 A.M., immediately after the day's observations, the Kindergarten C students were returned to their own school.

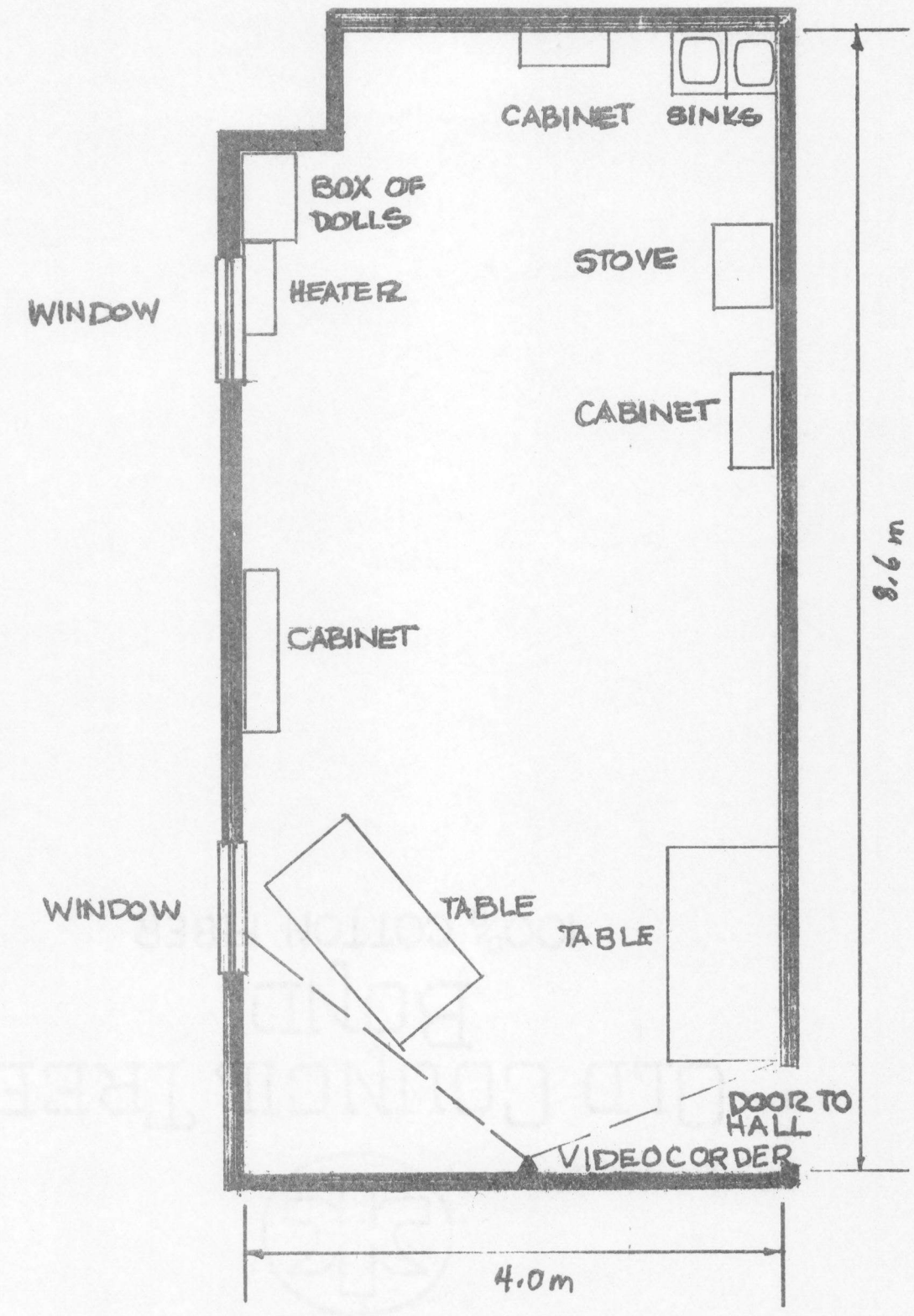


Figure 8. Floor plan of play room, Kindergarten B, normal spatial density condition.

During the play period, the experimenter and the teacher interacted with the children only to prevent injury to a group member.

Experimental Procedures

During the habituation period, the research worker not only familiarized himself with the children, and they with him and his camera, but each of the children later to be involved in this project was videotaped during two one-half hour play sessions in his own classroom. This provided some baseline data as to the frequency of their various social behaviors amongst persons they knew in familiar surroundings.

The first experimental manipulation called for conditions of low spatial density. For eight consecutive sessions, each of the nine group members was allowed about 3.0 square meters in which to play, or about 2.2 square meters of open floor space per person.

Immediately following were eight half-hour play periods in which a curtain reduced the room size to 2.0 square meters per person, or 1.0 square meters of open floor space. The contents of the room were kept in their same relative positions as done previously. (See Figure 9.)

Finally the group was observed for eight sessions again under conditions of 100% space. After the last observation, peer ratings and teacher rankings were obtained.

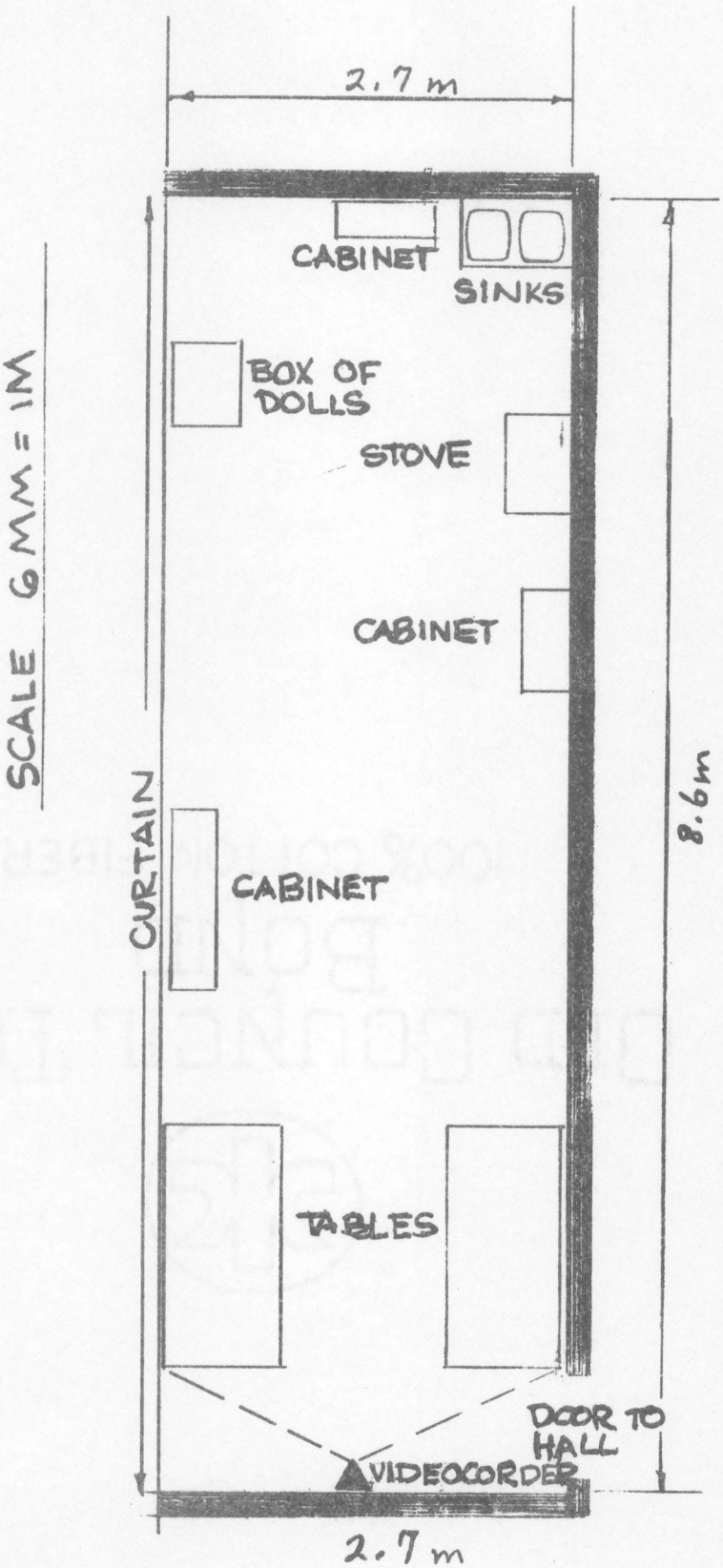


Figure 9. Floor plan of play room, Kindergarten B, high spatial density condition.

CHAPTER X

RELIABILITY

An undergraduate pre-med student volunteered to code the 24 half-hour video tapes taken in this experiment. Because the inter-observer reliabilities in the first part of the study were high, it was decided that the co-rater would check every fourth tape included in the second experiment. The same basic procedure of coding used previously was repeated here. This involved about 200 hours of observing for the researcher. Again the co-rater was unaware of the purposes of the study.

The reliability coefficients for each of the behavior categories are provided in Table 13. It is immediately evident that the reliability coefficients for experiment II were slightly lower than those obtained in the first experiment (mean = .88, $_{\text{range}}$ = .78-.96). The inter-observer agreement was reduced by the increased frequencies of behaviors for Group II making accuracy of count more difficult in the latter half of the study. However, these figures are higher, in most cases, than those reported by McGrew (1972), and are certainly acceptable.

TABLE 13

INTER-OBSERVER RELIABILITY COEFFICIENTS, EXPERIMENT II

Behavior Category	Reliability Coefficients
Hit	.93
Push-Pull	.80
Object Destruction	.88
Negative Expletive	.95
Object Struggle	.91
Hold Out	.83
Physical Contact	.87
Walk	.94
Run	.91
Jump-Hop	.84
Laugh	.96
Fall	.78
Wrestle	.81

CHAPTER XI

RESULTS OF EXPERIMENT II

Group Dominance Hierarchy

The dominance hierarchy for Group II was described using basically the same measures applied to Group I. Win, ratio, and matrix rank orders were constructed for each of the three experimental conditions. The Spearman Rank Order correlation between the win and matrix hierarchies was .82, $p<.01$; between win and ratio hierarchies, r_s = .87, $p<.01$; and between ratio and matrix hierarchies, r_s = .85, $p<.01$.

The matrix hierarchy for this period is presented in Figure 10. As there were no intransitivities in the matrix, a perfect linear rank order was described for the group. It was somewhat surprising that there were no inconsistencies in the hierarchy, as some instability was expected as the strangers worked out the group dominance structure. Calculation of the Kendall Coefficient of Concordance also indicated stability on a daily basis ($W = .26$, $x^2 = 16.44$, $df = 8$, $p<.05$).

At the end of the study, rather than at the beginning, the teacher who had observed the group throughout the experiment ranked the children as had been done in experiment I. Peer ratings based on "dominance" were also obtained at this time. Table 14 provides the Kendall Tau B correlations and the probabilities associated with them among the several variables ranked by the teacher and the win and matrix dominance orders. In this group of children under normal spatial conditions, dominance, aggressiveness, intelligence, and activity were all

Subject	12	13	14	19	17	16	15	20	18	Rank
(M)12		1	1	1	1	1	1	1	1	1
(M)13	0		1	1	1	1	1	1	1	2
(M)14	0	0		1	1	1	1	1	1	3
(F)19	0	0	0		1	-	1	-	1	4
(F)17	0	0	0	0		1	-	-	1	5
(M)16	0	0	0	-	0		1	1	-	6
(M)15	0	0	0	0	-	0		1	-	7
(F)20	0	0	0	-	-	0	0		1	8
(F)18	0	0	0	0	0	-	-	0		9

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 10. Matrix hiearchy for the newly-formed group in low spatial density condition (A).

TABLE 14

KENDALL TAU B CORRELATIONS AMONGST TEACHER RANKINGS AND DOMINANCE HIERARCHIES, NEWLY-FORMED GROUP

	Dominance Rank	Aggressiveness Rank	Sociability Rank	Intelligence Rank	Activity Rank	Friendliness Rank	Cooperativeness Rank	Win Hierarchy	Matrix Hierarchy
Dominance Rank	---	.77***	.00	.72***	.77***	.11	.50**	.50**	.44*
Aggressiveness Rank		---	.11	.83***	.77***	.00	.38	.38	.55**
Sociability Rank			---	.16	.11	.77***	.50**	.50*	.33
Intelligence Rank				---	.61***	.16	.22	.33	.50**
Activity Rank					---	.11	.61***	.50*	.44*
Friendliness Rank						---	.50*	.38	.22
Cooperativeness Rank							---	.66**	.72***

*p<.1.

**p<.05.

***p<.01.

associated with one another. The sociability, friendliness, and cooperativeness rankings were also significantly interrelated. The teacher's impressions correlated with the win hierarchy were dominance, sociability, activity, and cooperativeness. Her rank orderings of dominance, aggression, intelligence, activity, and cooperativeness were associated closely with the matrix hierarchy.

The peer ratings were also highly correlated this time with the win and matrix hierarchies of this period. The Kendall Tau B correlation coefficients were .77, $p = .003$ and .83, $p = .001$, respectively. The children's ratings were also related to the teacher's rankings on the traits of dominance (.50, $p = .06$), sociability (.50, $p = .06$), activity (.50, $p = .06$), and cooperativeness (.77, $p = .003$). These results indicated that both the teacher and the children in the group very closely agreed in their perceptions of the group dominance structure, and their impressions were based upon essentially the same traits or behaviors associated with these characteristics.

The four demographic variables weight, height, age, and nursery school experience were examined for this group in relation to the various rankings. This data is presented in Table 15. Weight and height were again closely associated, and both were correlated with dominance, and activity. Age was related to sociability, cooperativeness, peer rank of dominance, and the win hierarchy. Nursery experience correlated significantly with peer rank and the win and matrix hierarchies.

There were no shifts in the group population of the newly-formed group over spatial density conditions as occurred in Group I. For the

TABLE 15

KENDALL TAU B CORRELATIONS AMONGST A NUMBER OF DEMOGRAPHIC VARIABLES, TEACHER RANKINGS, PEER RATINGS, WIN HIERARCHY AND MATRIX HIERARCHY (CONDITION A) OF THE NEWLY-FORMED GROUP

	Weight	Height	Age	Nursery Experience	Dominance Rank	Aggressiveness Rank	Sociability Rank	Intelligence Rank	Activity Rank	Friendliness Rank	Cooperativeness Rank	Peer Rank	Win Hierarchy	Matrix Hierarchy
Weight	---	.77***	.05	.23	.44*	.33	.11	.38	.44*	.00	.27	.27	.27	.22
Height		---	.16	.11	.44*	.44*	.11	.27	.66**	.22	.50*	.38	.38	.33
Age			---	.29	.27	.16	.59*	.11	.38	.38	.55**	.55**	.55**	.38
Nursery Experience				---	.29	.41	.17	.35	.23	.00	.29	.47*	.54**	.58**

*p<.1.

**p<.05.

***p<.01.

"crowded" period (condition B), win, ratio, and matrix rank orders were constructed as before. The Spearman Rank Order Correlation coefficient was .64, $p<.05$ for the win and ratio hierarchies; .85, $p<.01$ between win and matrix rank orders; and .74, $p<.05$ for ratio and matrix ranks.

As Figure 11 illustrates, there were no inconsistencies in the matrix rank order. Unlike experiment I, there was no change in the group dominance structure when the Group II children were placed in a reduced play area. The Spearman correlation for the win hierarchies, conditions IIA and IIB, was .80, $p<.01$. The ratio hierarchies were correlated at .64, $p<.05$; and the matrix hierarchies at .78, $p = .01$. The rank order was stable from day to day, as well ($W = .39$, $x^2 = 24.96$, $df = 8$, $p<.01$).

The change in the group social hierarchy occurred in condition VI, when the play room was returned to its normal dimensions. Correlations for win hierarchies between conditions A and C, and B and C were non-significant, as were correlations between these conditions for the ratio and matrix hierarchies. Neither were the peer rank, demographic variables nor any of the teacher's rankings associated with either of the dominance hierarchies for condition C.

Figure 12 illustrates that there were several intransitivities in the matrix for this period ($d = 18$). And the Kendall Coefficient of Concordance indicates that the rank order was changing from day to day, as well ($W = .14$, $x^2 = 9.02$, $df = 8$, $p =$ n.s.). These results suggest that what had been a fairly stable group social structure for a period

Subject	12	14	19	13	16	15	17	20	18	Rank
(M)12		1	1	1	1	1	1	1	1	1
(M)14	0		1	1	1	-	-	-	-	2
(F)19	0	0		1	1	1	-	-	-	3
(M)13	0	0	0		1	1	1	1	1	4
(M)16	0	0	0	0		1	1	1	1	5
(M)15	0	-	0	0	0		1	-	1	6
(F)17	0	-	-	0	0	0		1	1	7
(F)20	0	-	-	0	0	-	0		-	8
(F)18	0	-	-	0	0	0	0	-		9

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 11. Matrix hierarchy for the newly-formed group in high spatial density condition (B).

Subject	14	19	20	12	13	16	18	15	17	Rank
(M)14		1	1	0	1	1	-	-	-	1
(F)19	0		1	1	1	0	1	1	1	2
(F)20	0	0		1	-	1	-	-	1	3
(M)12	1	0	0		1	1	1	0	1	4
(M)13	0	0	-	0		1	1	-	1	5
(M)16	0	1	0	0	0		1	-	1	6
(F)18	-	0	-	0	0	0		1	1	7
(M)15	-	0	-	1	-	-	0		1	8
(F)17	-	0	0	0	0	0	0	0		9

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 12. Matrix hierarchy for the newly-formed group in low spatial density condition (C).

of about four weeks, changed and became less stable during the final two weeks of the experiment, when spatial density conditions were returned to normal. The teacher and the group members obviously based their impressions upon the relationships established during the majority of the time the group played together.

The matrix hierarchies were examined in relation to the degree of acquaintance between Group II members. As stated earlier, the newly-formed group was comprised of three triads, the members of which came from three separate classrooms. The members of each triad had experience with other members of that same class, but were strangers to the members of the other triads. The composition of the triads was as follows: subjects 12, 17, 18; 13, 14, 16; and 19, 20, 15. Before these three groups were even brought together, the teacher of each classroom was asked to rank the children from her class on dominance. The subjects noted immediately above are listed, from left to right for each triad, from highest to lowest rank as described by their teacher.

Reviewing the matrix hierarchy for the first experimental condition into which the entire group of relative strangers was placed (Figure 10, page 93) the reader will note that with the exception of subjects 20 and 15, the triad members maintained the same dominance positions with respect to one another as they evidenced in their own classrooms. Nor were the relationships affected by placing the subjects in conditions of high spatial density. However, one change occurred within each traid for the third experimental condition.

TABLE 16

COMPARISONS OF SOCIAL BEHAVIORS, GROUP MEANS OF WEIGHTED TOTALS FOR GROUP II (9Ss), ALL EIGHT THIRTY-MINUTE OBSERVATION PERIODS UNDER EACH SPATIAL DENSITY CONDITION

Behavior Pattern	LOW (IIA) Mean	SD	HIGH (IIB) Mean	SD	LOW (IIC) Mean	SD	F*	p
Hit	5.79	3.47	9.73	6.62	8.05	3.55	5.004	.04
Push-Pull	5.09	2.90	5.20	2.40	6.59	2.17	2.855	n.s.
Object Destruction	9.72	6.99	5.68	4.82	6.55	4.35	6.318	.01
Negative Expletive	4.96	2.63	5.89	4.26	5.91	2.47	1.227	n.s.
Object Struggle	2.82	1.09	3.03	1.34	2.17	0.68	1.549	n.s.
Hold Out	2.65	1.27	4.18	0.79	3.69	0.82	7.801	.01
Physical Contact	10.12	2.75	10.56	2.11	10.00	2.41	0.625	n.s.
Walk	18.77	2.53	17.74	2.43	15.26	2.54	14.298	.001
Run	8.42	3.71	7.50	4.01	7.80	2.66	0.691	n.s.
Jump-Hop	3.91	2.28	5.83	2.56	3.86	1.61	1.888	n.s.
Laugh	3.38	3.22	3.97	3.51	3.02	2.21	0.671	n.s.
Fall	4.19	2.73	3.31	2.38	3.03	1.80	3.772	.08
Wrestle	2.62	2.12	1.68	1.60	0.93	0.92	4.860	.04

*One-Way Analysis of Variance; p is for a two-tailed test; df = 2/16.

Comparisons of the number of object struggles which took place between members of a triad as opposed to between members of separate triads during the three experimental conditions corraborates these results. During conditions A and B, the triad members participated in dominance struggles, significantly more often than expected on a random basis, with members of other triads than with members of their own class (x^2 = 19.5, df = 1 , $p<.001$ for condition A; and x^2 = 3.96, df = 1, $p<.05$ for condition B). In condition C there was no difference in the number of object struggles within as opposed to between triads (x^2 = .05, df = 1, p = n.s.). Dominance relationships amongst members of the same triad, which had been established for some time, underwent changes during this period, as did relationships in dominance amongst members of separate triads.

The Effects of Altered Space on the Social Behaviors

As in experiment I, to make more complete use of the data gathered on all nine subjects in the group for the eight days comprising each experimental condition, the totals for each behavior by subject and by condition were weighted. The square roots of the group means were then compared for each social behavior by a One-Way Analysis of Variance with repeated measures. The results of these comparisons, presented in Table 16, are less straight-forward than those of experiment I. Hit and object destruction changed over the three conditions, and push-pull approached significance; as did hold-out and walk, fall and wrestle of the non-agonistic and quasi-agonistic categories, respectively. Where there were discrepancies between the parametric and non-parametric results, the differences

between the parametric and non-parametric results, the differences appeared attributable to the fact that the latter tests used only five of the eight days of data. For example, the frequency of hit was very low on the last three days of condition A, and quite high on the last three days of condition B (see Figure 13). Without this information, the non-parametric Friedman ANOVA found no significant differences amongst the three conditions (Appendix E). In the case of object destruction, high mean values on the last days of condition A and low frequencies on the last three days of condition B increased the differences between the first low density condition and the other two experimental situations. The conservative estimates of the differences for fall and wrestle over the three conditions given by the non-parametric techniques again do not take into account the last three days of each condition which, Figure 14 indicates, contain important data.

Paired t-tests were next performed to specify the location of the significant differences noted by the F tests. The increases in hit for conditions B and C over A were both significant. Push-pull also increased in the latter two conditions, but the difference was significant only from high spatial density to low spatial density circumstances. Object destruction decreased significantly from conditions A to B and A to C. However, this was probably the result of the experimenter prohibiting, from the thirteenth session on, the children from throwing the chairs and certain of the toys around the room for fear a child might be seriously harmed.

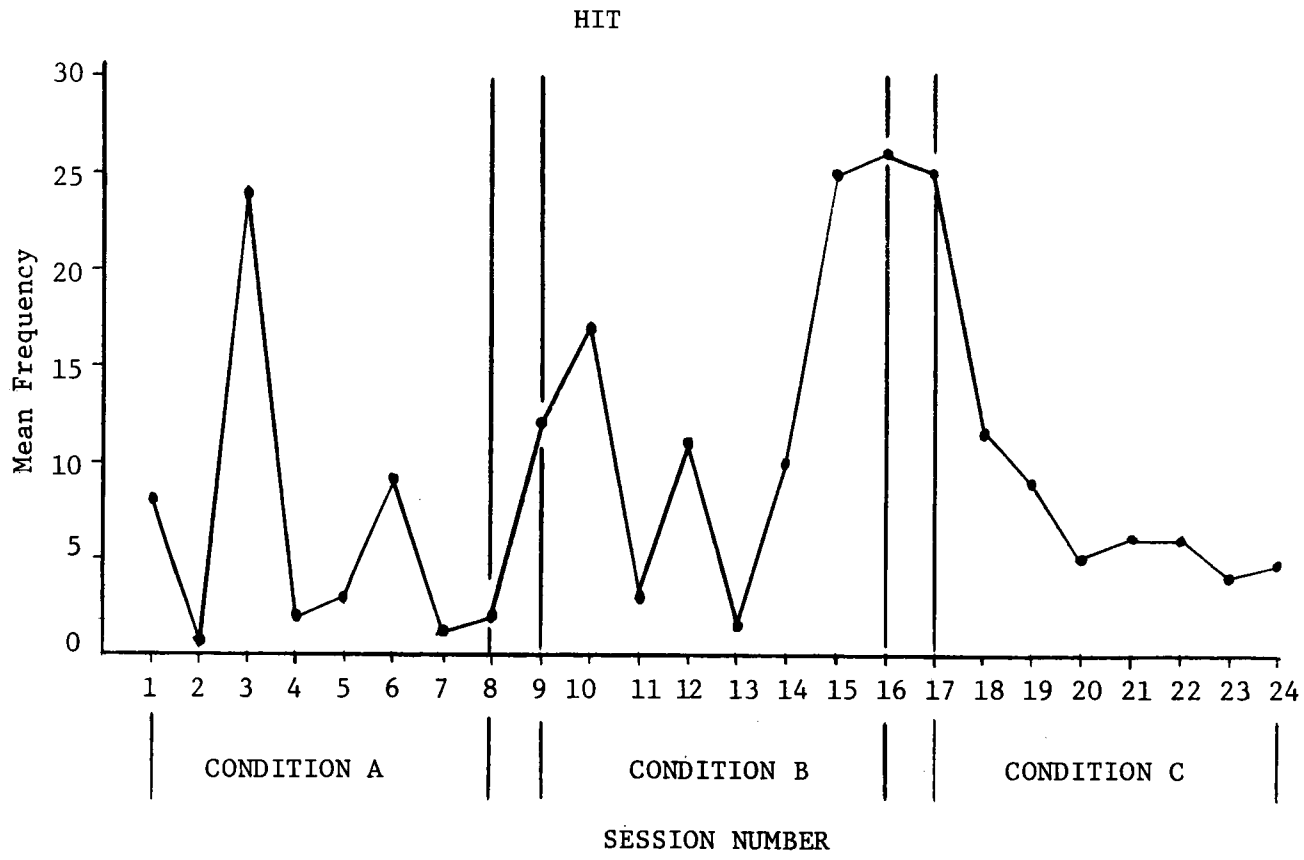


Figure 13. Mean frequencies per observation session for the agonistic behaviors evidenced by Group II.

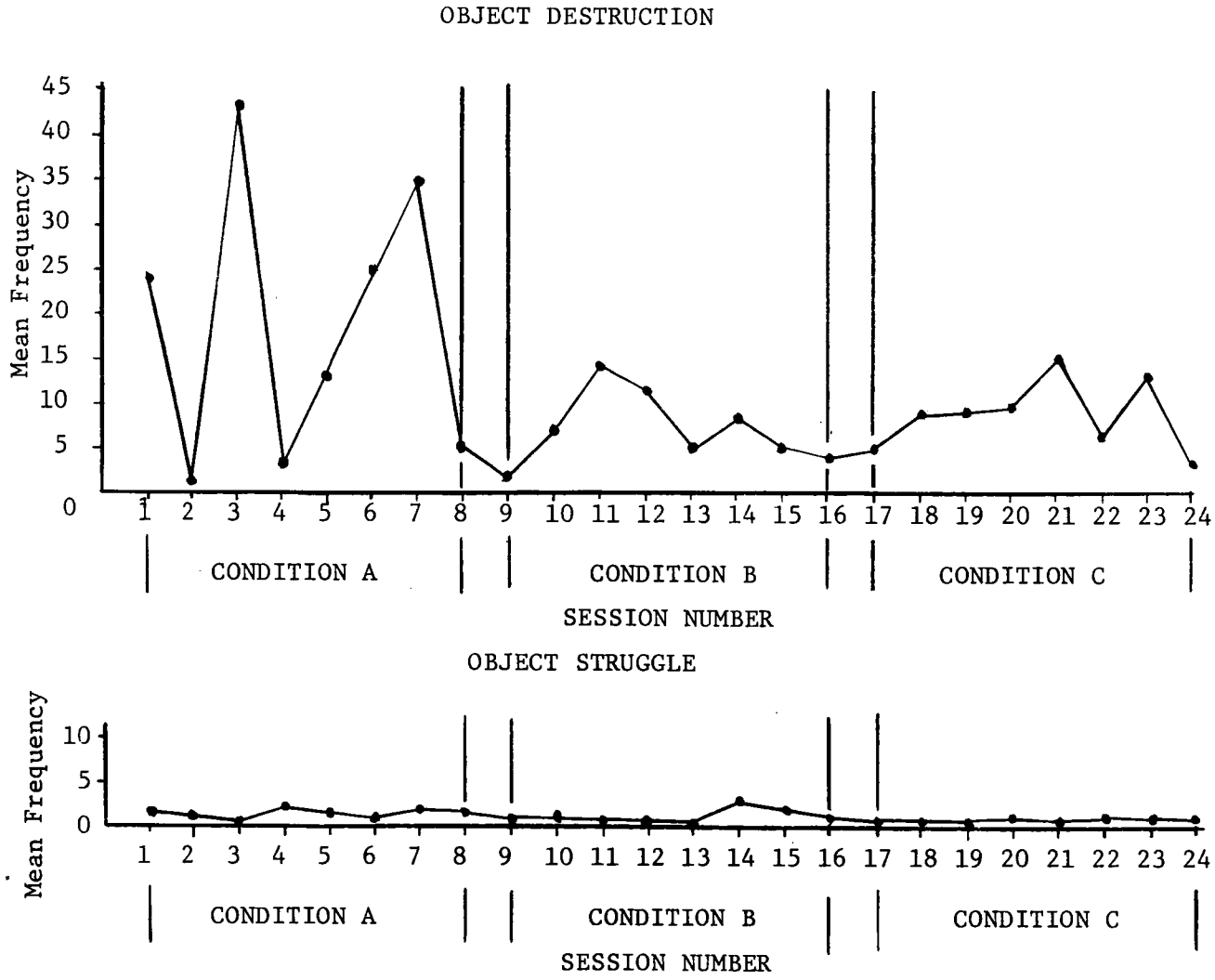


Figure 13. (continued).

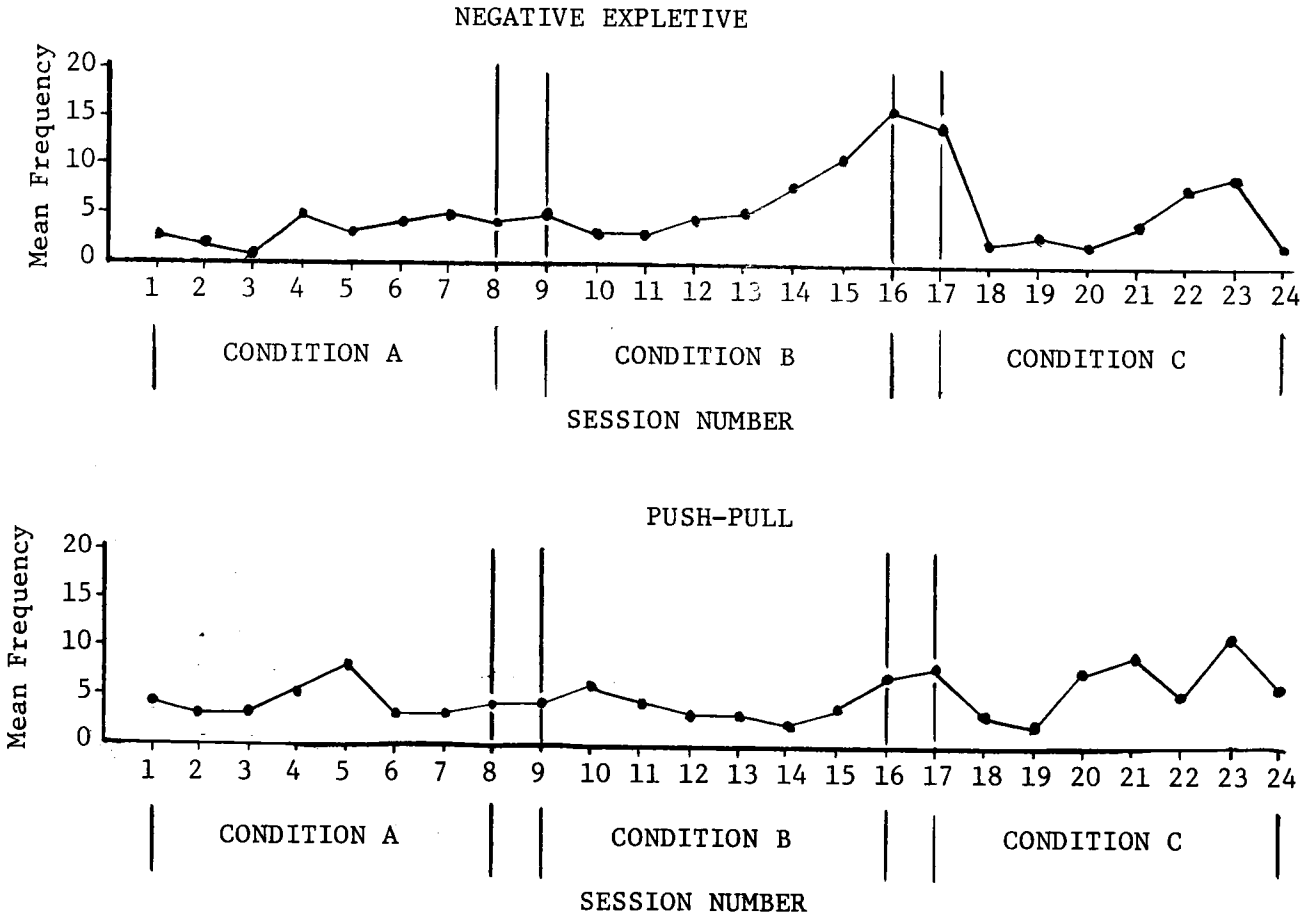


Figure 13. (continued).

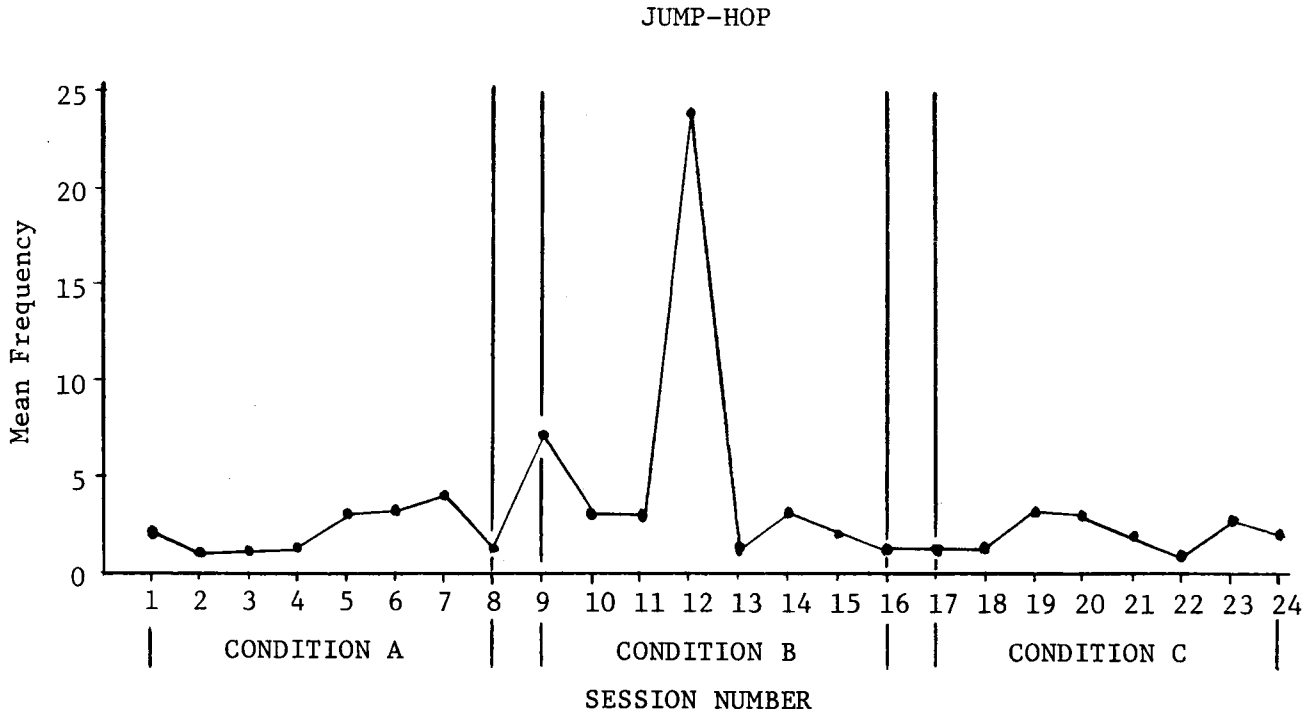
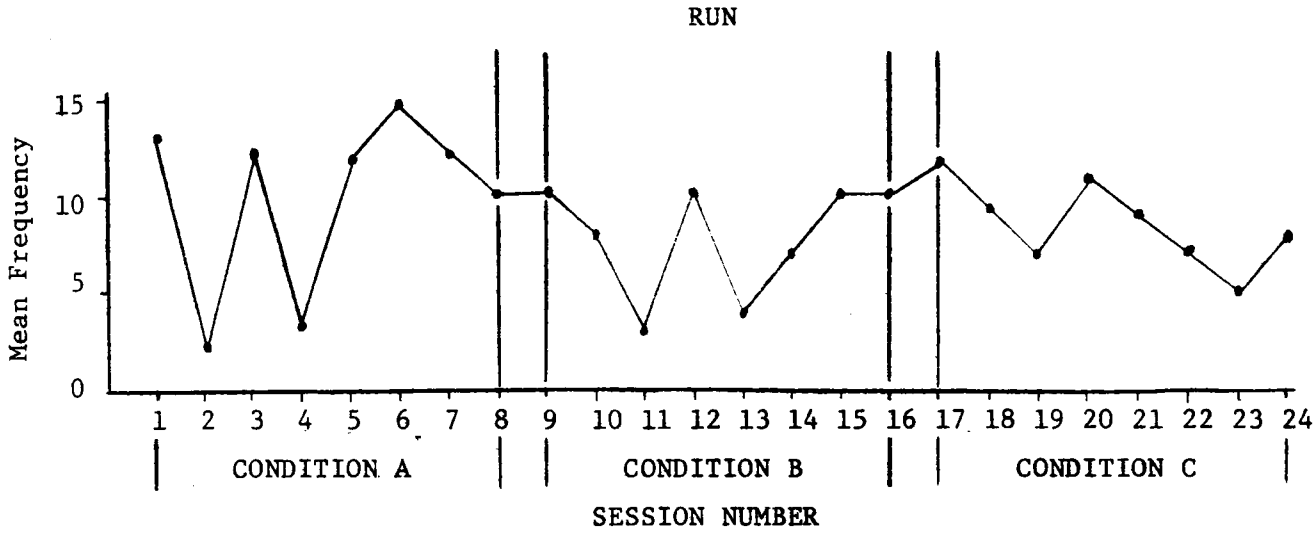


Figure 14. Mean frequencies per observation session for the quasi-agonistic behaviors evidenced by Group II.



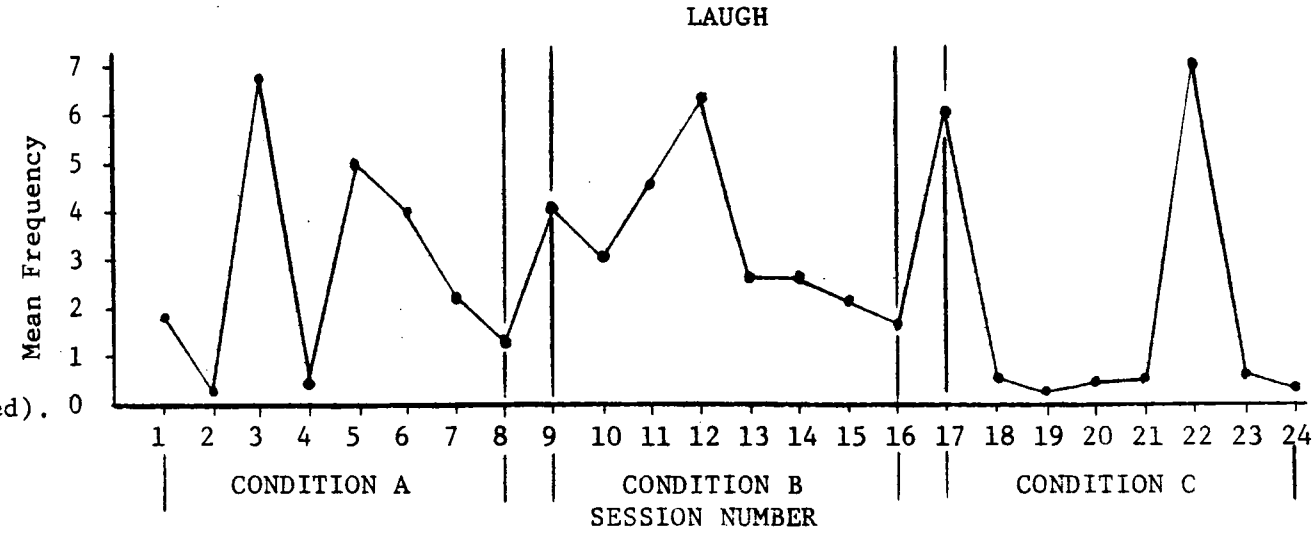
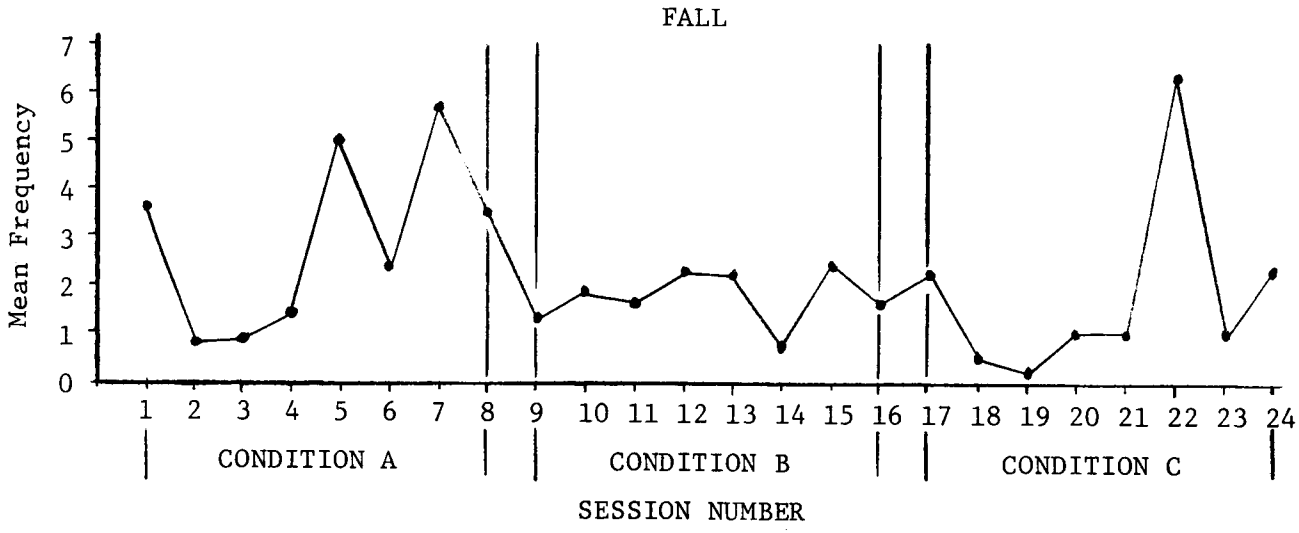


Figure 14. (continued).



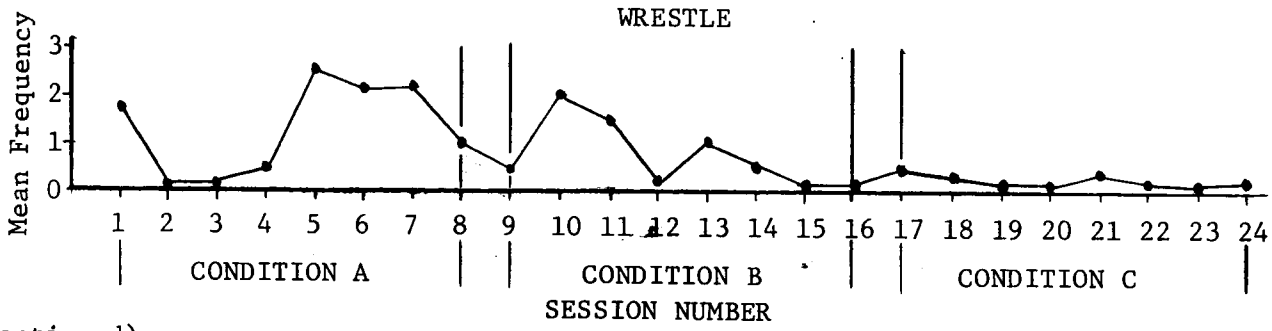


Figure 14. (continued).

Of the non-agonistic behaviors, hold out increased from condition A to condition B and to condition C. While walk, on the other hand, decreased over the experimental sessions, as did fall and wrestle of the rough-and-tumble play behaviors (see Figure 15).

Most interesting in this experiment was the difference between the final low spatial density condition, and the two preceeding periods. It was during condition C that the group dominance structure changed. And, although the play area was returned to its normal dimensions, three of the agonistic behaviors increased or remained unchanged from condition B. All of the non-agonistic and four of the five quasi-agonistic motor patterns, while not differing significantly, decreased from the high density period to condition C. These results indicate an increase in agonistic behavior and a reduction of play when the group hierarchy became unstable, regardless of spatial density circumstances. (See Tables 17 and 18.)

We have noted that the group dominance hierarchy was stable in condition A, but changed and became less stable during condition C. Although it was not planned by the experimenter, this circumstance provided an opportunity to examine the effect that the unstable rank order had on this group with spatial density held constant. The t-tests provided in Table 19 indicate that of the agonistic behaviors, hit, push-pull, and negative expletive increased significantly in condition C over condition A. The decrease in object destruction is probably attributable to the researcher's intervention, as explained above. In terms of the non-agonistic behaviors, hold out increased,

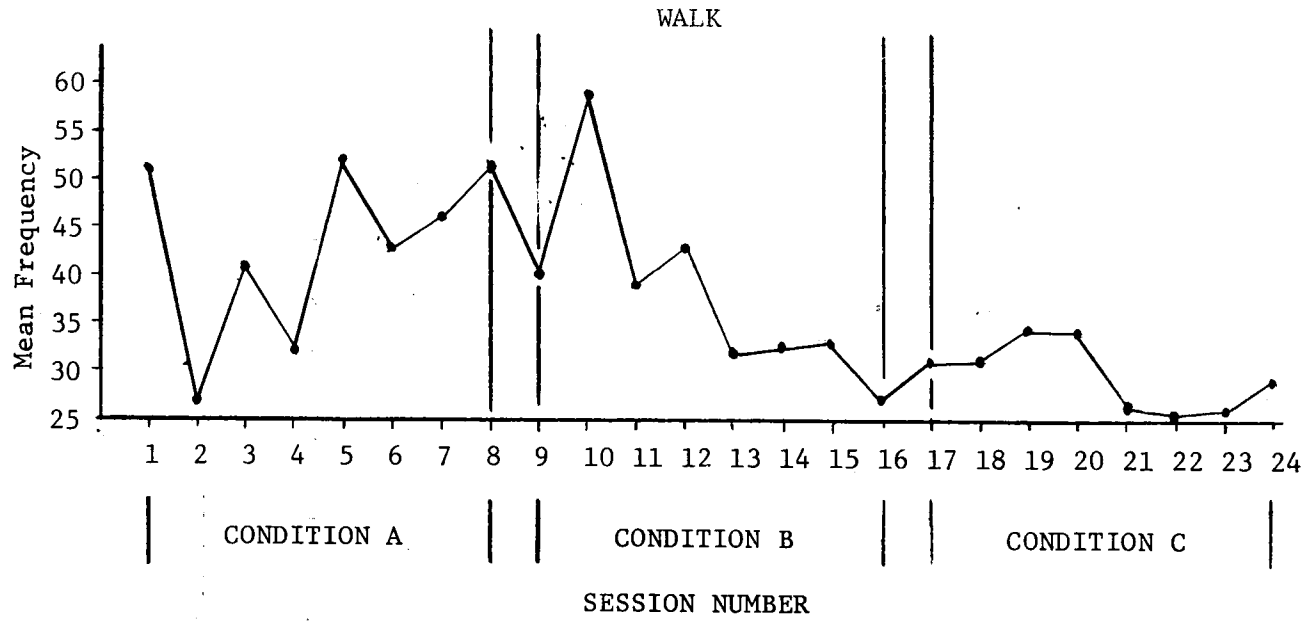


Figure 15. Mean frequencies per observation session for the non-agonistic behaviors evidenced by Group II.

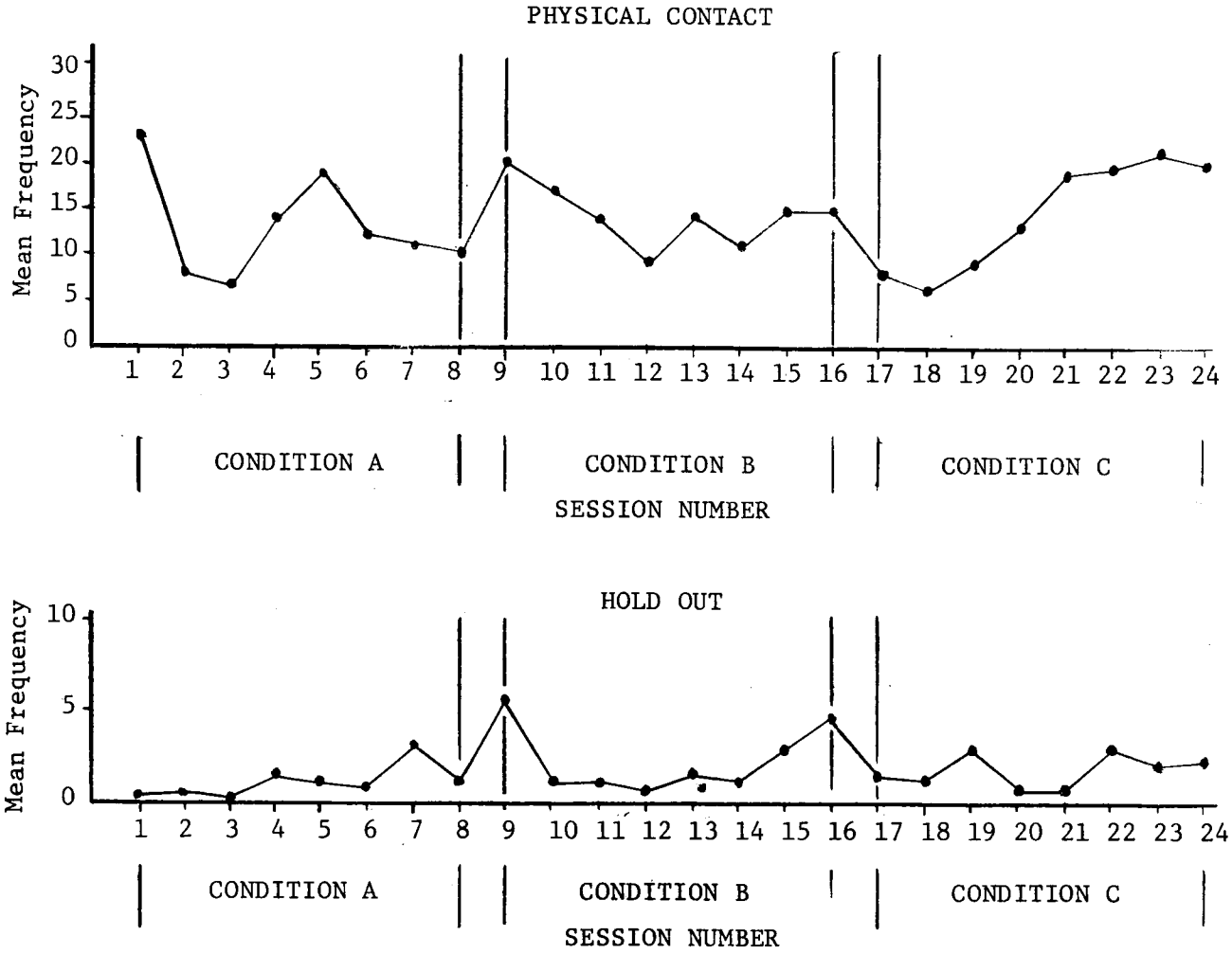


Figure 15 (continued).

TABLE 17

COMPARISONS OF THE SOCIAL BEHAVIORS, PAIRED T TESTS FOR GROUP II (9Ss) IN LOW (IIA) VERSUS HIGH (IIB) SPATIAL DENSITY CONDITIONS

Behavior Pattern	t*	p
Hit	2.54	.036
Push-Pull	0.15	n.s.
Object Destruction	2.86	.02
Negative Expletive	1.30	n.s.
Object Struggle	0.37	n.s.
Hold Out	3.19	.014
Physical Contact	0.97	n.s.
Walk	1.24	n.s.
Run	1.28	n.s.
Jump-Hop	1.30	n.s.
Laugh	0.82	n.s.
Fall	1.82	n.s.
Wrestle	1.50	n.s.

*Student's t-test, p is for a two-tailed test, df = 8.

TABLE 18

COMPARISONS OF THE SOCIAL BEHAVIORS, PAIRED T TEST COMPARISONS OF GROUP II (9Ss) IN HIGH (IIB) AND THEN LOW (IIC) SPATIAL DENSITY CONDITIONS

Behavior Pattern	t*	p
Hit	1.26	n.s.
Push-Pull	3.33	.010
Object Destruction	1.34	n.s.
Negative Expletive	0.04	n.s.
Object Struggle	1.63	n.s.
Hold Out	1.52	n.s.
Physical Contact	1.15	n.s.
Walk	4.14	.002
Run	0.35	n.s.
Jump-Hop	1.76	n.s.
Laugh	1.01	n.s.
Fall	0.80	n.s.
Wrestle	1.65	n.s.

*Student's t-test, p is for a two-tailed test, df = 8.

TABLE 19

COMPARISONS OF THE SOCIAL BEHAVIORS, PAIRED T TEST
COMPARISONS OF GROUP II (9Ss) IN BOTH LOW
SPATIAL DENSITY CONDITIONS
(IIA AND IIC)

Behavior Pattern	t*	p
Hit	3.26	.012
Push-Pull	1.73	n.s.
Object Destruction	2.31	.040
Negative Expletive	1.84	n.s.
Object Struggle	1.60	n.s.
Hold Out	2.84	.02
Physical Contact	0.20	n.s.
Walk	6.28	0.00
Run	0.78	n.s.
Jump-Hop	0.08	n.s.
Laugh	0.44	n.s.
Fall	2.45	.040
Wrestle	3.16	.012

*Student's t-test, p is for a two-tailed test, df = 8.

while walk decreased significantly. All of the quasi-agonistic motor patterns decreased from A to C, while only fall and wrestle reached the .05 level of significance.

This rather limited examination indicates that increases in agonistic motor patterns and decreases in the frequency of rough-and-tumble play were co-terminus with an unstable group social structure in these pre-school children. This experiment did not answer the questions as to whether the group instability induced the agonistic behaviors, or vice-versa, or whether the greater number of agonistic encounters, once begun, furthered the changes in hierarchical structure. Neither could the influence of the reduction of positive play be examined with respect to these factors.

CHAPTER XII

DISCUSSION OF EXPERIMENT II

The results with respect to density condition are less definitive for this experiment than for the first. However, all of the agonistic behaviors, with the exception of object destruction, showed some increase in frequency from low to high spatial density periods. Because the group dominance hierarchy did not change appreciably during conditions A and B, these results appear to be completely attributable to the reduced play area. Unfortunately, they may be confounded by the growing acquaintance amongst the children over the four week period.

McGrew (1972) found that when he placed eight strangers into a playroom with five pre-schoolers who were acquainted with one another, it took several days before the children began to interact. The frequencies of object struggle, push, and negative expletive all increased as the week, during which he observed the children, progressed. McGrew's results seemed principally due to the fact that the majority of the children, the new comers, acted "subdued and inhibited," and kept their interactions with the other children to a minimum while they sized up the situation. McGrew states of the group:

> During the first day or two they seemed to avoid potentially agonistic situations which they would later react to with resistance or counter-aggression. As the first week progressed, this restraint seemed to lessen and children gave the impression of then seeking to define limits of aggression, for example, seeing how far a quarrel could be pushed before tears resulted (p. 145).

A very similar reaction could explain what occurred in Group II observed by this researcher. While some interaction occurred amongst members of separate triads, this was really minimal during the first one and one-half treatment conditions. Basically, the members of each triad played with one another, even separating themselves spatially at times from the other children. Reducing the play area in condition B increased the agonistic behaviors to some degree, but less so than predicted because the children still maintained at least some social, if not physical, distance from members of other triads. This may not have occurred for such an extended period of time had all of the children been strangers to one another. But because each child had two others in the room whom he knew, and with whom he could play, there was less need to form relationships with strangers. The observer's subjective impressions were that inter-triad interactions were increasing during the latter half of the high density period, and that both growing acquaintance and higher density influenced the increasing degree with which agonistic encounters occurred.

The really dramatic changes occurred in condition C, in which density was not an influential factor. By this time all of the group members were interacting with one another to a greater extent. The formation of new relationships could have changed the superficial inter-triad group structures in existence during period A and B which then increased agonistic motor patterns. Or, alternatively, agonistic behaviors became more frequent as the children began testing each other out, and the unstable group rank order was the result. In either case, the results of this experiment indicate that it is important that the

researcher be aware of the social relationships amongst the subjects, either animal or human, which he employs to examine the effects of density.

CHAPTER XIII

RESULTS OF EXPERIMENTS I AND II

In this section, experiments I and II are analyzed as a whole. The means for each social behavior for each of the subjects by condition were weighted on the basis of eight observation periods. The square roots of these means were taken as before in order that the variance might be more homogeneous. Each social behavior was then analyzed by a three-way Analysis of Variance, as a function of Group (Friends-Strangers*), Sex (M-F), and Spatial Density Conditions (A-B-C). The source table for hit, Table 20, provides an example of the model followed in analyzing all of the motor patterns observed (Winer, 1962). The F values and their associated probabilities for the three-way ANOVA are presented in Table 21. Only significant findings will be discussed below. As the Group X Condition effects were reviewed in an earlier discussion, these results will not be presented here.

Agonistic Social Behaviors

There were significant effects for the variable hit on all three main factors. Hit occurred more frequently by strangers than friends, by males than females, and more frequently in high spatial density conditions than in low density circumstances. There was a significant

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*Although the term "strangers" is employed throughout this discussion, this is a relative term, to contrast the relationships between Group I members with those in Group II. The reader will remember that some of the children in Group II knew each other quite well, while the acquaintance amongst all of these Ss increased over the duration of the experiment.

TABLE 20

ANALYSIS OF VARIANCE FOR HIT

Source of Variation	df	MS	F
Between Subjects			
Group	1	312.78	23.69**
Sex	1	111.58	8.45*
Group X Sex	1	150.17	11.37**
Subj. w/ Group (error between)	13	13.20	
Within Subjects			
Condition	2	31.81	7.93*
Condition X Group	2	23.12	5.76*
Condition X Sex	2	14.16	3.53*
Cond. X Group X Sex	2	8.57	2.14
Cond. X Subject w/ Groups (error within)	26	4.01	

*$p < .05$.

**$p < .01$.

TABLE 21

F VALUES AND ASSOCIATED PROBABILITIES FOR THE THIRTEEN SOCIAL BEHAVIORS AS A FUNCTION OF GROUP, SEX, AND DENSITY CONDITION

Behavior Pattern	Group	Sex	Condition	Gp. X Sex	Cond. X Gp.	Cond. X Sex	Cond. X Gp. X Sex
Hit	23.69**	8.45*	7.93*	11.37**	5.76*	3.53*	2.14
Push-Pull	35.48**	10.81**	1.17	7.37*	7.08**	0.33	0.72
Object Destruction	12.76**	15.49**	3.97*	6.07*	7.08**	2.82	0.13
Negative Expletive	6.52*	6.97*	1.45	0.34	2.40	1.30	0.03
Object Struggle	2.21	6.47*	8.70**	0.32	3.86*	0.49	1.13
Hold Out	0.68	0.03	4.07*	0.90	12.17**	1.34	0.67
Physical Contact	25.50**	0.72	18.01**	0.12	11.80**	8.77**	5.88**
Walk	17.58**	16.04*	25.44**	0.04	1.04	7.57**	5.26*
Run	6.19*	35.50**	0.78	0.27	0.04	1.46	2.60
Jump-Hop	0.01	2.72	5.11*	1.90	1.51	2.95	3.18
Laugh	1.51	7.95*	1.38	0.22	0.47	0.87	1.91
Fall	2.74	41.50**	7.74**	0.58	1.06	0.68	1.54
Wrestle	16.53**	12.96**	1.42	6.50*	4.52*	0.55	2.24

*p<.05.

**p<.01.

Group X Sex interaction effect. F tests were performed to test between mean ratings of male and female, friends and strangers, separately. The results indicated that male strangers hit more than male friends ($F = 40.05$, $p = .0001$). and that female strangers hit more than well-acquainted females ($F = 4.03$, $p = .05$). The significant Condition X Sex interaction was also further analyzed to determine how the sexes separately reacted to low versus high density conditions. Males showed a tendency to hit more in high density circumstances ($F = 2.86$, $p = 0.1$), while density conditions did not alter the frequency females hit other children.

There were significant group and sex effects on the dependent variable push-pull. Strangers engaged in this agonistic behavior more than friends, and males more than females. F tests were performed on the significant Group X Sex interaction. Male strangers engaged in push-pull more than male friends, and female strangers more than female friends ($F = 48.64$, $p = .0001$; $F = 4.88$, $p = .03$, respectively).

Significant main effects occurred for all three independent variables on object destruction. Again, strangers performed this motor pattern more frequently than friends, and males more so than females. Unexpectedly, this behavior occurred more frequently in the low spatial density condition A than in the low density condition C. The Group X Sex interaction, when analyzed, indicated that male strangers displayed this agonistic behavior more than male friends ($F = 28.76$, $p = .0001$). There was no effect on this behavior for females as a function of acquaintance.

For negative expletive only the main effects of group and sex were significant. Group II was more agonistic in this respect than Group I, and males uttered more negative expletives than females.

Object struggle was affected by sex and condition. Males were engaged more frequently in fights for possession of objects than were females. And these struggles occurred more frequently in the low than in the high density condition.

Generally then, the agonistic behaviors were influenced similarly by group, sex, and density condition. Members of the newly-formed group manifested these motor patterns more frequently than members of a well-acquainted group, and males evidenced them more frequently than females. Only the agonistic motor pattern hit increased significantly in the high spatial density situation. Strangers of both sexes were generally more agonistic than well-acquainted children of the same respective sex.

Non-Agonistic Social Behaviors

The only significant main effect for hold out was condition, in which this behavior occurred more frequently in condition B (high density) than in condition C (low density).

Physical contact differed over groups and over conditions. Unexpectedly this non-agonistic behavior occurred more frequently amongst strangers than amongst friends. It also reached greater frequencies in condition B than in condition C. The condition by sex interaction indicated that females showed a non-significant tendency to touch others more often in high than in low density period. For males, there was no difference.

Walk differed significantly as a function of all three variables. Strangers walked more than friends, males more than females, and this occurred more frequently in conditions A and B than in condition C. The significant Condition X Sex interaction showed that females walked less in conditions B and C than in A ($F = 6.06$, $p = .02$, and $F = 12.44$, $p = .004$). For males there were no differences.

Two of the three non-agonistic motor patterns observed in this study occurred more frequently among strangers than among friends. Hold out, physical contact, and walk also occurred more often in high than in low density circumstances. The interaction of sex and condition was important for these variables, with females more affected than males. Females walked the most in condition A, but touched others more when placed in a reduced play area.

Quasi-Agonistic Social Behaviors

The two significant main effects for run were group and sex. Group II members ran more than Group I Ss, and males ran more than females.

Density condition was the only variable to affect jump-hop. This behavior occurred more frequently in high than in low density situations.

Laugh varied as a function of sex. Males laughed much more frequently than females.

The two main effects on fall were sex and condition. Males fell more often than females, and this occurred more frequently in condition A than C.

Wrestle varied as a function of group and sex; strangers more than friends, and males more than females. The significant Group X

Sex interaction was analyzed. Male strangers wrestled more than male friends ($F = 20.69$, $p = .0002$). On the other hand, no female friends and stranger differences were manifested on this behavior.

Two of the rough-and-tumble play behaviors were more frequent in Group II than in Group I. However, the variable to which the most consistent differences in the quasi-agonistic behaviors were related was sex. Of the four motor patterns which were significant, males performed them more frequently than females in every case.

CHAPTER XIV

DISCUSSION OF EXPERIMENTS I AND II

Before the results from both of these experiments are discussed, it is important that the limitations of this research project be noted. One difficulty involved an assumption on the part of this experimenter that the dominance relationships amongst a group of well-acquainted children would remain stable when the group was exposed to high spatial density conditions, and that a group formed of children with relatively little experience with one another would present an unstable group social structure. While the fact that this did not occur is important in itself, this result made the effects of stable versus unstable group structures difficult to test by confounding it with density conditions. Order effects may have also been confounded with treatment effects, as high and low density conditions were not counter-balanced.

The relatively small number of Ss observed also limits the confidence with which one may wish to generalize these results. The fact that Ss were absent intermittently may have affected the formation of relationships, and the frequency with which other children performed certain social behaviors. While it is true that the behavior of one group member was not independent of the behavior of significant others around him, to divide the members of a class into artificial groups as did Loo (1972) does not help us to understand how density affects the behavior of pre-school children as they naturally play in the real world.

While the time these children spent in high density circumstances was longer than the periods subjects in some former studies have undergone (Freedman et al., 1971; and Loo, 1972), eight thirty-minute sessions is still very short compared to living all day, day after day in a high density environment. Further, the children probably became aware somewhere along the line that when the experimenter left for the day, they would no longer be expected to play in high density circumstances. Therefore great caution must be exercised in comparing these results with children who are exposed to dense living conditions for great lengths of time, and from which they find little or no means of escape.

With these qualifications in mind, some conclusions can be drawn from this research. First of all, the effects of spatial density are quite complex, and "crowding" is certainly not the only factor, or even the most important factor affecting the social behaviors of pre-school children during free-play. This study has shown that degree of acquaintance was an important determinant of agonistic responses in these children. As one might expect, well-acquainted children get along better with one another than do strangers. Part of the reason for this seems that, after an initial "hesitation" period, children test each other out to see who will dominate whom. If the group of children has not undergone this testing out period, and the group members are still maintaining social distance from one another, "crowding" them physically seems to have limited effects upon the social behaviors observed in this research. Once children become better acquainted and are interacting physically with one another, placing them in a reduced

play area has greater negative effects. Perhaps a greater sense of anomie is created when a well-established group with recognized norms and expectations is disrupted through high density, than a newly-formed group without such cohesive forces.

Sex is also an important variable with regard to children's behavior. Male children are more agonistic and engage in more rough-and-tumble play than female children, in terms of these motor patterns. These results are supported by McGrew (1972) and Hutt (1972). In terms of the sex by density interaction, with the exception that males hit more in high density than in low density conditions and females touched others more frequently in high density circumstances, density did not change the frequency with which either sex displayed the 13 social behaviors examined. The results of Freedman et al. (1971) support these findings. They noted that only when males and females were separately exposed to conditions of high density, was there a significant density by sex interaction. Males became more hostile and expressed more negative feelings in the "crowded" conditions, while females evidenced the reversed pattern. When the groups containing members of both sexes were examined together, these effects disappeared. These results place an important qualification upon density, and suggest that having members of both sexes present may help to reduce the anti-social effects which sometime occur when males alone are placed in high density circumstances.

When the effects of spatial density condition alone are viewed, without considering the other factors we have shown play a part in how

children react to such densities, the results do not follow a consistent pattern. Hit increased, while object destruction and object struggle became more frequent as density became greater. While other studies have noted a reduction in non-agonistic and play behavior as density increased, this research found that walk, hold out, physical contact, and jump-hop increased. Fall decreased for the two groups taken together.

If the 13 motor patterns noted in this study reflect to any significant degree the level of "interactions" a child has with other group members, then the frequency of interactions did not decrease in high density conditions in either group, as P. L. McGrew (1970) and Loo (1972) found in their research. The present study did not measure the time Ss spent playing with others versus time spent alone in low and high density periods. However, Group II was more active and Group I evidenced increased agonistic interactions when their play areas were reduced. It was only after density conditions were returned to normal that Group I Ss evidenced significant curtailment of their activities with others. The researcher has no explanation of why such a pronounced and consistent reduction in all of the social behaviors should have occurred for this group at this time.

Several other questions were raised but left unresolved by this study. It was shown that group instability was co-terminus with an increase in the frequency of the agonistic encounters and decrease in rough-and-tumble play. However, this information only stimulates us to ask which comes first or if there is some continuous interaction

amongst these factors. Further these results were obtained in low density conditions. Because degree of acquaintance was not directly related to stability as expected, this experiment did not allow for the comparison of otherwise equal stable and unstable groups, both in crowded conditions.

The effects of density are not simple. Humans seem to respond to density depending on a number of different circumstances. More research needs to be carried out on such factors as the number of subjects in a group, spatial versus social density, various degrees of density, length of time spent in such circumstances, the social relationships amongst those being "crowded," and the activities in which the subjects are engaged when placed into situations of various density.

Proshansky et al. (1970) explained the negative effects of density in terms of restriction of freedom of choice, and frustration of the individual in the pursuit of his aims. More specific knowledge is needed as to how various spatial versus social densitites may limit our freedom of behavior and/or frustrate us in acquiring incentives.

Density defined as increased social stimulation has received little attention. In the introduction to this paper, it was mentioned that some persons in certain situations view high density as stimulating and exciting, while other high density circumstances produce the familiar negative feelings we associate with being "crowded." Future research would find it productive and useful to define the parameters which determine these differential reactions.

The more completely we understand human reactions to high social and spatial densities, and the various physical, social, and emotional

factors which obviously play important roles in determining these reactions, the more appropriately will we be able to structure the physical and social environment so as to best keep people from feeling "crowded," and thereby reduce the frequencies of certain anti-social behaviors sometimes correlated with such feelings. As psychotherapists such a knowledge would increase our understanding of the perceptions and problems high densities create or contribute to in those who are subjected to such conditions in their homes, schools, work, and play areas. And from this knowledge should come suggestions as to how clients might mitigate the effects of such stresses which will probably be with us for some time.

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APPENDIXES

APPENDIX A

TABLE 22

COMPARISONS OF SOCIAL BEHAVIORS, RANK TOTALS FOR GROUP I (6Ss), FIRST TWO THIRTY-MINUTE OBSERVATION PERIODS UNDER EACH SPATIAL DENSITY CONDITION

Behavior Pattern	Spatial Density Condition			XR*	p
	IA (Low)	IB (High)	IC (Low)		
Hit	11.5	15.5	9.0	3.58	n.s.
Push-Pull	11.0	16.5	8.5	5.58	.071 p<.051
Object Destruction	11.5	17.0	7.5	7.58	.020 p<.010
Negative Expletive	9.5	16.5	10.0	5.08	n.s.
Object Struggle	15.5	10.5	11.0	6.58	.050 p<.020
Hold Out	15.0	14.5	6.5	7.58	.020 p<.010
Physical Contact	12.0	17.0	7.0	8.33	.01
Walk	14.0	13.0	9.0	2.33	n.s.
Run	10.0	13.5	12.5	1.08	n.s.
Jump-Hop	11.0	14.5	10.5	1.58	n.s.
Laugh	12.5	12.5	11.0	0.25	n.s.
Fall	12.5	15.0	8.5	3.58	n.s.
Wrestle	11.0	14.0	11.0	1.00	n.s.

*Friedman Two-Way Analysis of Variance, p is for one-tailed test.

APPENDIX B

TABLE 23

COMPARISONS OF SOCIAL BEHAVIORS, GROUP I (6Ss), FIRST TWO THIRTY-MINUTE OBSERVATION PERIODS UNDER LOW (A) AND THEN HIGH (B) SPATIAL DENSITY CONDITIONS

Behavior Pattern	Z	p*
Hit	1.572	.059
Push-Pull	1.990	.023
Object Destruction	0.943	n.s.
Negative Expletive	1.257	n.s.
Object Struggle	1.572	.058
Hold Out	0.104	n.s.
Physical Contact	1.991	.023
Walk	0.943	n.s.
Run	1.572	.058
Jump-Hop	1.153	n.s.
Laugh	0.524	n.s.
Fall	0.104	n.s.
Wrestle	0.104	n.s.

*Wilcoxon Matched-Pairs Signed-Ranks Test, p is for one-tailed test.

APPENDIX C

TABLE 24

COMPARISONS OF SOCIAL BEHAVIORS, GROUP I(6Ss), FIRST TWO THIRTY-MINUTE OBSERVATION PERIODS UNDER HIGH (B) AND THEN LOW (C) SPATIAL DENSITY CONDITIONS

Behavior Pattern	Z	p*
Hit	1.826	.034
Push-Pull	2.023	.021
Object Destruction	2.201	.014
Negative Expletive	1.826	.034
Object Struggle	1.618	.052
Hold Out	2.201	.013
Physical Contact	2.201	.013
Walk	1.782	.037
Run	0.539	n.s.
Jump-Hop	1.618	.053
Laugh	0.000	n.s.
Fall	1.826	.034
Wrestle	1.341	n.s.

*Wilcoxon Matched-Pairs Signed-Ranks Test, p is for one-tailed test.

APPENDIX D

TABLE 25

COMPARISONS OF SOCIAL BEHAVIORS, GROUP I (6Ss), FIRST TWO THIRTY-MINUTE OBSERVATION PERIODS UNDER BOTH LOW SPATIAL DENSITY CONDITIONS (A AND C)

Behavior Pattern	Z	p*
Hit	1.342	n.s.
Push-Pull	0.913	n.s.
Object Destruction	1.604	.054
Negative Expletive	0.419	n.s.
Object Struggle	0.535	n.s.
Hold Out	2.023	.021
Physical Contact	1.782	.037
Walk	1.363	n.s.
Run	1.572	.058
Jump-Hop	0.943	n.s.
Laugh	0.365	n.s.
Fall	1.604	.054
Wrestle	0.000	n.s.

*Wilcoxon Matched-Pairs Signed-Ranks Test, p is for one-tailed test.

APPENDIX E

TABLE 26

COMPARISONS OF SOCIAL BEHAVIORS, RANK TOTALS FOR GROUP II (7Ss), FIRST FIVE THIRTY-MINUTE OBSERVATIONS PERIODS UNDER EACH SPATIAL DENSITY CONDITION

Behavior Pattern	Spatial Density Condition			XR*	p
	IIA (Low)	IIB (High)	IIC (Low)		
Hit	11.0	14.0	17.0	2.571	n.s.
Push-Pull	11.0	12.0	13.5	5.429	.085
Object Destruction	16.5	12.0	13.5	1.500	n.s.
Negative Expletive	16.0	14.0	12.0	1.142	n.s.
Object Struggle	15.0	14.5	12.5	0.500	n.s.
Hold Out	9.5	18.5	14.0	5.785	.085>p>.52
Physical Contact	17.0	13.0	12.0	2.000	n.s.
Walk	20.0	15.0	7.0	12.286	.0003
Run	15.0	14.0	13.0	0.285	n.s.
Jump-Hop	10.0	18.5	13.5	5.214	n.s.
Laugh	12.5	16.5	13.0	1.357	n.s.
Fall	17.0	15.0	10.0	3.714	n.s.
Wrestle	16.5	16.0	9.5	4.357	n.s.

*Friedman Two-Way Analysis of Variance, p is for a one-tailed test.

APPENDIX F

TABLE 27

COMPARISONS OF SOCIAL BEHAVIORS, GROUP II (7Ss), FIRST FIVE THIRTY-MINUTE OBSERVATION PERIODS UNDER LOW (IIA) AND THEN HIGH (IIB) SPATIAL DENSITY CONDITIONS

Behavior Pattern	Z	p*
Hit	0.671	n.s.
Push-Pull	0.000	n.s.
Object Destruction	1.014	n.s.
Negative Expletive	0.000	n.s.
Object Struggle	1.014	n.s.
Hold Out	2.199	.014
Physical Contact	0.507	n.s.
Walk	1.521	.064
Run	0.671	n.s.
Jump-Hop	1.521	.064
Laugh	1.352	.088
Fall	1.353	.088
Wrestle	0.676	n.s.

*Wilcoxon Matched-Pairs Signed-Ranks Test, p is for one-tailed test.

APPENDIX G

TABLE 28

COMPARISONS OF SOCIAL BEHAVIORS, GROUP II (7Ss), FIRST FIVE THIRTY-MINUTE OBSERVATION PERIODS UNDER HIGH (IIB) AND THEN LOW (IIC) SPATIAL DENSITY CONDITIONS

Behavior Pattern	Z	p*
Hit	0.676	n.s.
Push-Pull	1.183	n.s.
Object Destruction	0.169	n.s.
Negative Expletive	0.676	n.s.
Object Struggle	0.730	n.s.
Hold Out	0.845	n.s.
Physical Contact	1.014	n.s.
Walk	2.366	.008
Run	0.676	n.s.
Jump-Hop	1.782	.037
Laugh	1.153	n.s.
Fall	1.521	.064
Wrestle	2.022	.021

*Wilcoxon Matched-Pairs Signed Ranks Test, p is for one-tailed test.

APPENDIX H

TABLE 29

COMPARISONS OF SOCIAL BEHAVIORS, GROUP II (7Ss), FIRST FIVE THIRTY-MINUTE OBSERVATION PERIODS UNDER BOTH LOW SPATIAL DENSITY CONDITIONS (IIA AND IIC)

Behavior Pattern	Z	p*
Hit	1.400	.080
Push-Pull	1.400	.080
Object Destruction	1.859	.031
Negative Expletive	0.140	n.s.
Object Struggle	1.190	n.s.
Hold Out	2.100	.017
Physical Contact	1.260	.103
Walk	2.380	.008
Run	0.630	n.s.
Jump-Hop	0.770	n.s.
Laugh	0.676	n.s.
Fall	1.540	.061
Wrestle	2.022	.021

*Wilcoxon Matched-Pairs Signed-Ranks Test, p is for one-tailed test.

APPENDIX I

TABLE 30

ATTENDANCE FIGURES FOR GROUP I SUBJECTS--THE NUMBER OF OBSERVATIONS UPON WHICH WEIGHTED MEANS WERE BASED

	CONDITION IA					CONDITION IB						CONDITION IC		
	Obs. Session					Obs. Session						Obs. Session		
Subjects	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	X	X	X	X		X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X	X	X		X	
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5		X	X		X	X		X	X	X				X
6	X	X	X	X	X	(Subject not used)								
7	X	X	X	X	X	X	X	X	X	X	X	X	X	
8	X	X	X			X	X	X	X	X		X	X	X
9	(Subject not used)					X	X	X	X	X	X	X	X	X
10	X	X	X	X		X	X	X	X	X			X	X
11	X	X		X		X	(Subject not used)							

APPENDIX J

TABLE 31

ATTENDANCE FIGURES FOR GROUP II SUBJECTS--THE NUMBER OF OBSERVATIONS UPON WHICH WEIGHTED MEANS WERE BASED

	CONDITION IIA								CONDITION IIB								CONDITION IIC							
	Observation Session								Observation Session								Observation Session							
Subjects	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
12	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	X	X		X		X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X						X	X	X	X	X	X	X	X	X	X	X	X
15	X	X		X	X	X		X	X	X	X	X	X	X				X	X	X				
16	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
17	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X			
19	X	X		X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X
20	X		X		X	X	X	X	X		X		X	X	X	X	X	X		X		X	X	X

APPENDIX K

Subject	2	5	1	3	8	7	10	4	6	Total Wins
(M)2		2	3	1	3	3	5	4	1	22
(M)5	0		1	-	-	-	-	-	-	1
(M)1	1	0		2	2	3	1	2	2	13
(M)3	0	-	0		1	2	1	3	-	7
(F)8	0	-	0	0		3	2	-	-	5
(F)7	1	-	1	0	0		2	2	-	6
(F)10	2	-	0	0	0	0		1	-	3
(M)4	1	-	0	0	-	0	0		1	2
(F)6	0	-	0	-	-	-	-	0		0
Total Losses	5	2	5	3	6	11	11	12	4	

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 16. Number of object struggles between subjects of the well-established group in low spatial density condition (A).

APPENDIX L

Subject	2	3	5	4	1	8	10	9	7	Total Wins
(M)2		3	1	3	1	3	3	3	2	19
(M)3	1		1	1	1	1	2	3	-	10
(M)5	3	0		1	0	-	-	-	-	4
(M)4	1	2	0		-	1	4	-	1	9
(M)1	0	0	1	-		-	1	-	-	2
(F)8	0	0	-	0	-		2	1	-	3
(F)10	0	0	-	1	0	0		1	-	2
(F)9	1	0	-	-	-	0	0		-	1
(F)7	0	-	-	0	-	-	-	-		0
Total Losses	6	5	3	6	2	5	12	8	3	

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 17. Number of object struggles between subjects of the well-established group in high spatial density condition (B).

APPENDIX M

Subject	12	13	14	19	17	16	15	20	18	Total Wins
(M)12		11	7	6	5	2	5	3	1	40
(M)13	6		2	3	1	3	1	7	1	24
(M)14	2	1		2	2	3	1	4	1	16
(F)19	0	0	0		3	-	1	-	1	5
(F)17	2	0	0	2		3	-	-	3	10
(M)16	2	1	1	-	2		2	2	-	10
(M)15	1	0	0	0	-	1		2	-	4
(F)20	0	1	0	-	-	1	0		3	5
(F)18	0	0	0	0	1	-	-	0		1
Total Losses	13	14	10	13	14	13	10	18	10	

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 18. Number of object struggles between subjects of the newly-formed group in low spatial density condition (A).

APPENDIX N

Subject	12	14	19	13	16	15	17	20	18	Total Wins
(M)12		4	-	6	14	3	4	3	5	39
(M)14	1		-	2	3	-	-	-	-	6
(F)19	-	-		2	1	3	-	-	-	6
(M)13	0	1	1		3	1	3	3	1	13
(M)16	2	1	0	1		3	6	1	2	16
(M)15	1	-	0	0	0		1	-	1	3
(F)17	0	-	-	0	0	0		1	4	5
(F)20	0	-	-	1	0	-	0		-	1
(F)18	0	-	-	0	0	0	1	-		1
Total Losses	4	6	1	12	21	10	15	8	13	

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 19. Number of object struggles between subjects of the newly-formed group in high spatial density condition (B).

APPENDIX O

Subject	14	19	20	12	13	16	18	15	17	Total Wins
(M)14		1	1	0	-	4	-	-	-	6
(F)19	0		7	0	2	0	-	2	10	21
(F)20	0	0		1	0	-	1	-	1	3
(M)12	3	2	2		3	7	2	2	4	25
(M)13	-	4	3	1		3	4	-	2	17
(M)16	0	2	-	1	1		2	-	3	9
(F)18	-	-	0	0	0	1		1	6	8
(M)15	-	0	-	1	-	-	0		-	1
(F)17	-	2	1	0	0	0	1	-		4
Total Losses	3	11	14	4	6	15	10	5	26	

Read wins for a subject horizontally. Read losses for a subject vertically.

Figure 20. Number of object struggles between subjects of the newly-formed group in low spatial density condition (C).

APPENDIX P

TABLE 32

MEANS AND STANDARD DEVIATIONS OF ALL VARIABLES FOR MALES AND FEMALES OF THE WELL-ESTABLISHED GROUP UNDER EACH SPATIAL DENSITY CONDITION

Variable	Sex	Low (A)		High (B)		Low (C)	
		Mean	SD	Mean	SD	Mean	SD
Hit	M	1.88	2.08	3.90	2.22	0.88	1.78
	F	3.98	0.63	4.05	0.64	0.00	0.00
Push-Pull	M	1.58	1.11	3.81	1.97	1.35	1.30
	F	2.52	2.05	3.25	2.35	0.00	0.00
Object Dest.	M	4.00	2.72	4.01	2.19	1.93	2.70
	F	0.47	0.81	3.93	2.18	0.00	0.00
Neg. Expletive	M	3.60	2.71	4.95	1.55	2.91	1.84
	F	2.30	0.51	2.08	0.64	0.66	1.15
Obj. Struggle	M	3.64	1.38	2.77	0.61	1.58	1.68
	F	3.61	0.36	1.61	1.81	0.00	0.00
Hold Out	M	4.18	1.19	3.53	0.61	2.57	1.73
	F	4.63	1.47	3.24	0.57	1.08	1.88
Phy. Contact	M	5.73	1.04	6.52	1.02	4.94	2.01
	F	7.36	1.30	7.29	0.28	1.15	2.00
Walk	M	15.80	2.83	15.52	2.53	15.00	1.32
	F	16.91	1.72	12.06	0.24	7.44	2.86
Run	M	6.58	1.51	7.76	2.68	9.07	3.12
	F	5.28	0.79	2.49	1.32	2.55	2.86
Jump-Hop	M	4.87	2.60	7.31	4.53	5.38	2.25
	F	6.12	2.39	3.95	2.08	0.00	0.00
Laugh	M	3.83	2.30	3.14	0.75	2.74	2.56
	F	1.59	1.58	1.46	2.52	0.00	0.00
Fall	M	4.51	0.68	4.07	1.45	3.13	1.31
	F	1.78	0.60	1.45	1.32	0.00	0.00
Wrestle	M	0.00	0.00	0.55	0.78	0.89	1.29
	F	0.00	0.00	0.42	0.73	0.00	0.00

APPENDIX Q

TABLE 33

MEANS AND STANDARD DEVIATIONS OF ALL VARIABLES FOR MALES AND FEMALES OF THE NEWLY-ESTABLISHED GROUP UNDER EACH SPATIAL DENSITY CONDITION

Variable	Sex	Low (A)		High (B)		Low (C)	
		Mean	SD	Mean	SD	Mean	SD
Hit	M	7.77	3.54	14.17	5.44	10.35	3.08
	F	3.31	0.92	4.20	1.96	5.18	1.06
Push-Pull	M	6.70	2.23	6.73	2.11	7.99	1.88
	F	3.09	2.49	3.30	0.82	4.85	0.75
Object Dest.	M	14.28	5.91	8.62	4.15	9.77	2.65
	F	4.02	2.41	2.01	2.59	2.54	1.57
Neg. Expletive	M	6.10	2.81	7.81	4.96	7.33	1.84
	F	3.54	1.73	3.49	1.35	4.16	2.08
Obj. Struggle	M	3.13	1.31	3.57	1.65	2.11	0.88
	F	2.43	0.73	2.36	0.30	2.26	0.43
Hold Out	M	2.34	1.65	4.22	0.93	3.58	0.80
	F	3.06	0.54	4.14	0.70	3.83	0.93
Phy. Contact	M	10.24	2.12	11.34	1.05	10.59	2.51
	F	9.99	3.77	9.61	2.58	9.26	2.38
Walk	M	19.81	1.46	19.33	1.95	16.64	1.94
	F	17.47	3.20	15.76	1.14	13.54	2.24
Run	M	10.86	2.12	10.14	3.21	9.68	1.40
	F	5.38	2.92	4.19	1.71	5.47	1.78
Jump-Hop	M	4.37	1.44	4.89	1.96	4.65	1.68
	F	3.34	3.22	7.02	3.00	2.88	0.92
Laugh	M	5.41	2.91	5.61	3.88	3.51	2.86
	F	0.84	0.94	1.94	1.68	2.43	1.14
Fall	M	6.21	1.45	4.91	1.87	4.20	1.63
	F	1.67	1.35	1.32	0.98	1.58	0.16
Wrestle	M	4.04	1.08	2.43	1.70	1.44	0.83
	F	0.86	1.73	0.75	0.95	0.28	0.57

VITA

Mark Howard Richman was born in Dallas, Texas, March 1, 1942. He attended public school in Beaumont, Texas, until his graduation from Beaumont High School in 1959.

The next five years were spent acquiring a Bachelor of Arts Degree. His first two years were at Tulane University, New Orleans, Louisiana. The following two years were spent at Lamar State College of Technology, Beaumont, Texas. He finally graduated from the University of California, Berkeley, California, in July of 1965.

In September, 1965, he entered the School of Social Work at the University of Michigan, Ann Arbor, Michigan. He graduated from this institution in June, 1967, with a Master of Social Work degree. From July, 1967, to August, 1969, he served as a Peace Corps Volunteer in the Republic of Panama. In September, 1969, he entered the Graduate School at the University of Tennessee. From September 1973 to September 1974, he will be serving as a clinical psychology intern at the Sacramento Medical Center, Sacramento, California. He expects to receive his Doctor of Philosophy degree, with a major in Psychology, in December, 1974.

He is married to the former Irene J. Daly of New York. The Richmans have one child, Erik, age 2.