THE EFFECTS OF DOMINANCE RANK AND SEX ON PRESCHOOL CHILDREN'S PROXEMIC BEHAVIOR

ROBERT JOHN COFFIN

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by

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A Thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts

Department of Anthropology
Memorial University of Newfoundland

August 1975

St. John's Newfoundland

ABSTRACT

An eight week field study, utilizing naturalistic methods of observation, was conducted in a St. John's day care centre to ascertain the effects of rank in the dominance hierarchy and sex on preschool children's proxemic behavior on both the microspatial and macrospatial behavioral levels.

A dominance hierarchy based on the outcome of dyadic physical and verbal agonistic encounters was constructed for each sex. It was found that males were easier to rank and had more stable hierarchies, and that they also were more involved in dominance behaviors than girls. Boys were also found to be generally dominant over girls.

In order to test the usefulness of dominance rank and sex as intervening variables, a number of hypotheses concerning preschool children's proxemic behavior were derived from studies on nonhuman primates and human adults and tested on a group of preschool children. Dominance rank differences, with dominants being more direct than subordinates, were found to be significant for tactile contact and voice loudness in both sexes, and for eye contact in girls. Sex differences were found in eye contact and body orientation, with males being more direct and involved in both cases. On the macrospatial level, there were rank differences in jurisdictional behavior and areas avoided for girls, with dominants showing more jurisdiction and fewer avoided areas, but there were no rank differences on any measures for boys. No sex differences were found found in the preschool children's macrospatial proxemic behavior.

It was concluded that both sex and dominance rank are useful as intervening variables in the prediction of preschool children's proxemic behavior.

ACKNOWLEDGEMENTS

I would very much like to take this opportunity to say thanks to the many people who both helped me with this thesis and made my stay as a graduate student at Memorial a pleasant and rewarding one.

First, I would like to thank the members of my thesis committee; my supervisor, Dr. Robert Barakat, Dr. Jean Briggs, and Dr. Jon Lien, for their many helpful comments and suggestions. I would also like to thank Prof. Louis Chiaramonte, Dr. Fred Gearing, and Dr. Jack Strawbridge who offered comments on the research proposal.

Phyliss Artis was very helpful in my finding a day care centre in which to do the research; Susan Ayres and the other teachers at the school helped me with many details and made the observational aspect of the study an enjoyable one.

I would also like to thank Prof. Tom Nemec who, although not involved in this thesis in any way, helped me in numerous other ways and was a fine person to study with. Thanks also to Alex Estrada, an undergraduate professor, who had an important influence on me, and my fellow graduate students for many moments of comic relief.

My wife, Susan, helped me with the organization of this report and took many hours away from her own work to help me with the frustrating statistical analysis. To her, I offer many thanks.

Finally, I would like to thank all 34 of the children who acted as the subjects of this research for being enlightening as well as fun to be with.

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CHAPTER I

INTRODUCTION

This thesis is concerned with an aspect of human behavior that Edward Hall has termed proxemics. Hall (1966) coined the term proxemics to refer to the study of man's relationship to the spatial dimension of his environment -- his spatial needs and perceptions, his structuring and use of space. This includes a broad range of spatial behavior, from the use of space in interpersonal interaction to the layout of cities. Watson (1974), drawing on Hall's research, divides the study of proxemic behavior into three categories: (1) microspace; (2) mesospace; (3) macrospace. The miscropatial level refers to the use of minute quantities of space in interpersonal social interaction while the meso and macrospatial levels refer to the transactions that take place betewen man and his proximate environment, i.e. mesospatial refers to the arrangement of furniture and other architectural features while macrospatial refers to the arrangement of these features into larger units. This thesis is concerned with preschool children's use of space on both the microspatial and macrospatial levels. That is, the use of space in interpersonal encounters and transactions between the children and the architectural features of the nursery school were examined.

Hall (1974:16) notes that how an individual reacts spatially to others is the product of a number of situational factors such as the context of the situation and the emotions and personalities of the individuals involved in the interaction. Each of these factors can be further subdivided; for example, contextual variables include the physical setting of the interaction, the activity taking place and the relationships of the individuals to one another in a social system. Hall notes that each of these subdivisions constitutes a major area of proxemic research. It is with this last set of factors, the relationships of individuals in a social system, that this thesis is specifically concerned.

Hall (1974:16) specifies three factors that go together to make up a relationship - (a) relative status or rank in a social system; (b) age; and (c) sex. Both age and sex are variables which have been fairly well studied by proxemicists but the importance of rank in a social system has been the subject of very little empirical research. Research on human spatial behavior has been carried out, for the most part, on dyads and not on stable groups of individuals interacting within a social system. Because of this research emphasis on dyads and not on stable groups of individuals, contextual variables such as dominance rank in the group's hierarchy have generally been neglected. However, measures of nonverbal behavior become more meaningful when seen in the social context in which they normally function. As Hall (1974: 21) states, "Information out of context is meaningless and cannot be reliably interpreted".

A research strategy which takes the social organization of the group into account when deriving hypotheses and/or explaining results is better designed to offer insight into the dynamics of spatial behavior than is a strategy based only on measures of personal space in dyads or individuals about whom little is known. By taking the social organization of the group into account one is including many contextual variables, such as interindividual relationships, which exert important influences on proxemic behavior.

Research in animal behavior (i.e. Calhoun, 1962a; Chance, 1967; and McBride, 1964) has traditionally taken the social organization of the group studied into account and because of this these studies provide a useful guide to the development of hypotheses to be tested on the human level. In this study a number of hypotheses derived mainly from animal behavior research were tested on a group of preschool children in an effort to determine their generality of scope.

Statement of the Problem

The main purpose of the study is to assess the effects of two contextual variables involved in interpersonal relationships, sex and dominance rank, on preschool children's proxemic behavior. The object is to show that these two variables may be useful predictors of the children's spatial behavior. The general questions asked were: Are there spatial behavior correlates of dominance rank? Are there sex differences in preschool children's proxemic behavior? The structure and interrelationships of the two behavioral systems, the interpersonal relationships and the proxemic behavior, were examined to see how they related to, and were influenced by, one another.

Significance of the Study

A number of researchers have made assumptions concerning the importance of dominance rank and sex on preschool children's behavior in general, and more specifically on their proxemic behavior. For example, Blurton Jones (1967) and Edelman and Omark (1973) have questioned whether or not dominance is a useful concept for describing and for explaining preschool children's behavior. However, dominance is a useful concept only to the degree that it can be used as an intervening variable which can predict other behaviors (Richards, 1974). Since neither Edelman and Omark nor Blurton Jones attempted to predict other behaviors using dominance rank as an intervening variable, they cannot really conclude that dominance is not a useful concept for use on the preschool age level. The present study aims to show that dominance rank can be used as an intervening variable to predict spatial behaviors. To the degree that this goal is successful, the concept of dominance is useful.

Concerning the issue of sex differences in proxemic behavior, Aiello and Aiello (1974) have studied the development of proxemic behavior in children aged six through sixteen. From the results of work on this age group they argue that sex differences are of only minimal importance in the proxemic behavior of young children. However, before any conclusions can be made empirical studies are necessary on young children, especially preschoolers. Only two studies have examined preschool children's microspatial proxemic behavior and one (Eberts and Lepper, 1975) found no sex differences while the other study (Beach and Sokoloff, 1974) found some sex differences and reported results which were suggestive of others. The research reported in this thesis aimed to add some empirical data on sex differences which might help in resolving this issue. Also, there are very few empirical studies of preschool children's macrospatial proxemic behavior available and Edney (1974), in a recent review article on human spatial behavior, cited the need for research on both the developmental aspects of, and sex differences in, human territorial behavior.

As noted, very few studies of naturally occurring children's proxemic behavior have been carried out and the few that have been done were generally restricted to the microspatial or interpersonal proxemic level, and even here, restricted consideration almost exclusively to measures of personal space. My research examined preschool children's spatial behavior on two levels: (1) the microspatial or interpersonal level; and (2) the macrospatial or physical environmental level (i.e. se DeLong, 1970:70; Watson, 1974:315). Also, a more complete proxemic study encompassing five variables: (1) personal distance; (2) body orientation; (3) eye contact; (4) tactile contact; and (5) voice loudness, was undertaken. Hall (1963, 1966) has shown that these variables are as important as actual distance for the study of proxemic behavior, so they should be taken into account in any proxemic research study.

Limitations of the Study

Due to limitations in time, money, and other factors, there are a number of shortcomings in this study. First of all, the concept of dominance hierarchy is not equivalent to social organization; there are many aspects of both social organization and individual relationships, of which dominance is only one. Friendship, peer popularity, etc. are other similar variables involved in interpersonal relationships and which also probably affect proxemic behavior. Also, the study was done on only one group of preschool children who may or may not be representative of preschool children in general.

Methodological limitations include, because of financial reasons, lack of inter-rater reliability tests and lack of more complex video recording techniques. Another limitation was that proxemic observations on the inter-personal level were carried out only on same-sexed dyads. No data on male-female proxemics were collected. Finally, a larger sample of proxemic observations should have been carried out. This last limitation will become evident in the discussion of the findings of the thesis.

CHAPTER II

REVIEW OF THE LITERATURE

Dominance Hierarchies - Introduction

The concept of dominance hierarchy was first used in 1922 by Schjelderup-Ebbe in his study of the social organization of fowl. He discovered that if a number of birds are placed together in a pen they engage in a series of fights with each individual pairing off against every other individual, one at a time, until a pecking order or dominance hierarchy is established. Once the hierarchy has been established, the frequency of fighting declines because each individual recognizes his position and tries not to antagonize his superiors. Each flock of fowl usually has two hierarchies, one for each sex. (Guhl, 1956).

The concept of dominance hierarchy became very popular and has been used in the study of many animals species with the result that, today, dominance hierarchies are generally considered to be a core feature of social organization common to many animals.

As the concept came to be applied to the study of nonhuman primates, a number of problems arose, for the concept of dominance hierarchy erroneously became synonymous with social organization. Several primatologists criticized this use of the concept in field studies on primates (i.e. Gartlan, 1968; Bernstein, 1970: and Rowell, 1974). Formerly it was thought that dominance hierarchies were an ever-present, all-pervasive feature of social life in primates. But as the above critics have pointed out, hierarchies are not very important in some species and they do not determine group structure as was once thought. Rather, primate social organization is determined by a number of factors of which dominance is but one.

The critics also rejected the notion that dominance is a cluster of interrelated behavior patterns. For example, Bernstein (1970) studied six species of monkeys, noting the frequency and directionality of three behavior patterns commonly associated witb dominance; agonistic behavior, mounting and grooming. He found that there were no significant correlations between the hierarchies determined from each of these three measures in any group. He concluded that thses three behavioral systems are not derived from any single mechanism and most importantly, that one measure does not necessarily allow one to predict other social behaviors. Thus, the critics note that since the concept of dominance hierarchy has limitations both in describing group structure and predicting other behaviors, the concept should be replaced by a more useful one.

However, even these critics note that generally there are status of rank differences among individual non-human primates and that the concept of dominance may be useful in more limited ways (i.e. Bernstein, 1969: 452). Many other primatologists have found the concept of dominance hierarchy to be useful in describing some aspects of group structure and also in helping to predict other social behaviors. For example, Richards (1974) in a study of six groups of macague monkeys, used ten different measures of dominance and found significant correlations between the ranks determined by the different measures. Richards concludes that dominance is useful as an intervening variable; that is, it may be used to predict a wide variety of social interactions. Numerous other workers have also found the concept to be useful in a variety of ways in studying non-human primates.

Callan (1970:125) asks the question, "Do the various ranking systems reported for a wide range of species, have a common structural core? And if so, what are the consequences for all social organizations including human ones?". In the remainder of this chapter, primate dominance hierarchies will be examined in an attempt to specify some of their common core structural features. Next, the implications of these core structural features for human ranking systems will be discussed.

Dominance Hierarchies - Nonhuman Primates

Hierarchies are common features in primate groups although there is a great deal of variability between, and even within, species in rigidity of the hierarchy, amount of agonistic behavior, and so on. The open-country baboons and macaques have hierarchies which best approximate Schjelderup-Ebbe's original concept of a dominance hierarchy. They have well defined, stable hierarchies in which the frequency of agonistic behavior shows the importance of rank for social behavior. In one of the early classical studies on baboons Hall and Devore (1965) found that the group was organized around the male dominance hierarchy. Adult males were dominant over the adult females and the bulk of the dominance interactions took place between the males with little fighting occurring between the sexes. The ranks were not linear for the males because coalitions and other factors complicated the picture. A central hierarchy consisting of three adult males who closely associated with one another in the centre of the troop while the less dominant males congregated on the periphery of the group, was the general structure. The adult female ranks were more difficult to delineate and were more unstable. Younger males separated into same-sexed peer groups and spent a great deal of time playing. Play[1] in the all male groups is rougher and dominance interactions are more intense. By their fifth year, sub-adult males are dominant over adult females.

This general pattern is common to baboons and macaques although there are variations in rigidity of the hierarchy, frequency of agonistic behavior, etc., due to ecological and other differences between groups living in different areas (i.e. see Patterson, 1973; Rowell, 1966b; and Saayman, 1971).

From this general outline of baboon ranking systems, four core structural units can be identified: (1) males are generally dominant over females and are more involved in dominance interactions; (2) males are easier to rank than females and have more stable hierarchies; (3) each sex has a separate hierarchy; and (4) early dominance relations are learned in peer group play.

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[1] The term 'play' is a waste paper basket category for various behaviors and a general definition of play is hard to give. Loizos (1967) defines play as a positive approach towards and a non-rigid interaction with other group members which involves stimulation of the sensory modalities. Most researchers agree that play helps socialize the youngster and determines to some degree one's adult behavior (Jolly, 1972; Poirier, 1972).

These four core units are quite commonly found throughout the primate order. For example, males are generally dominant over females in virtually all species, the only clear-cut exception being lemurs in which females are dominant over males (Jolly, 1972:185). Males are also usually more aggressive and engage in more dominance interactions than females in primates. For instance, Goodal (1965) reports that among chimpanzees, 76% of the dominance interactions took place between adult males, while Poirier (1970) found that among langurs adult males accounted for 88% of the dominance interactions.

The second principle that males are easier to rank and have more stable hierarchies than females has also been reported for a number of species. Chance and Jolly (1970) term female ranking systems "assemblies" since their structure is generally less rigid than those of males. Candland et al (1973) found that in captive squirrel monkeys, the males had a highly reliable linear rank order while the female had no reliable hierarchy. Jay (1965) found that whereas male langurs had a well defined and consistent hierarchy, the female hierarchy was unclear, and only general levels of dominance rank could be identified. This finding of males being easier to rank and having more stable rank orders has also been reported for gorillas (Schaller, 1965), rhesus macaques (Kaufmann, 1967; Lindberg, 1971), and bonnet macaques (Simonds, 1965).

However, while in many species this principle holds true, it does not apply to all species studied. For some species, for example rhesus monkeys, female ranks can sometimes be as clear as males (Sade, 1976) and even on very rare occasions clearer than male ranks (Oki and Maeda, 1973). One of the reasons why males are generally easier to rank is probably that they engage in more agonistic interactions (Goodal, 1965; Poirier, 1970). The comparatively infrequent dominance encounters among females makes their hierarchial relationships more difficult to determine.

The third and fourth principles, that each sex has a separate hierarchy and dominance relationships are learned in early peer play, have also been found in a number of species. For example, males and females in most sexually dimorphic species form separate-sexed hierarchies primarily because of the males larger size and greater canines. Because of these features, dominance interactions between the sexes are dangerous and therefore uncommon. Lancaster (1972) found that in vervet monkeys the hierarchies of the sexes often functioned separately. Poirier (1970) also found that langurs formed separate hierarchies on the basis of sex and that most dominance interactions were between members of like age/sex classes.

These separate sex hierarchies may well have their ontogenetic origins in the same-sexed peer play groups which are common to many species. Ranson and Rowell (1972) found that at around the age of six months young baboons begin to separate into same-sexed play groups. By the second year the males group is more permanent and rough and tumble play and play fighting are more common. Females avoid rough and tumble play and spend much of their time with older females, caring for young infants. Poirier (1972) paints a similar picture of early langur social interaction. After weaning, infant langurs become segregated by sex with the male groups being more stable and engaging in more rough play. Dolhinow and Bishop (1972) note that in all sexually dimorphic species, young males play more roughly than females. They state that the great deal of physical contact that occurs in play "makes ranking almost inevitable" (Dolhinow and Bishop, 1972: 324).

Thus, early dominance patterns appear in rough and tumble play and it is during such social interactions that individuals become familiar with both dominant and subordinate roles. The basis of the adult dominance hierarchy may be formed in these early play groups (Poirier and Smith, 1974).

This early sex difference in rough and tumble play probably also leads to males being generally dominant over females and also to their having more clear-cut hierarchies. The following section on human dominance hierarchies will examine to what extent the four core structural units of primate dominance hierarchies are present in human ranking systems.

Dominance Hierarchies - Humans

Dominance hierarchies are also a conspicuous feature of human behavior and the four core structural units of primate ranking systems have analogies on the human level.

Tiger (1969) notes that cross-culturally, male dominance occurs almost, if not, universally. He refers to the male dominance hierarchy as being "the spinal cord" of human society. Callan (1970), after also examining cross-cultural data, argues that the status of women in society is often a loosely defined one, both for biological (i.e. females spend much time in child rearing) and cultural (i.e. exogamous and virilocal marriage) reasons.

More empirical studies have also found analogies to primate ranking systems.

Grant (1972) found that the male mental patients that he studied had a stable ranking system which persisted over considerable periods of time. These systems varied from linear ranking systems to pyramidal ranks with several subordinates at the bottom. Esser (1970) found similar rank orders in another group of male mental patients.

Studies of human adolescents report similar results. Sherif (1956) studied group formation in 11 - 12 year old boys. A group of strangers were brought together and within a few days a leader with lieutenants emerged while others sifted to the bottom of the hierarchy. Williams (1974) found that six thirteen year old males in a summer camp also quickly arranged themselves into a hierarchy. He found correlations between dominance rank and athletic ability and leadership. He also argues that the dominance hierarchy acted to reduce aggression. Esser (1968, 1973) found that two groups of boys between the ages of six and fourteen had rank orders and also that rank order was related to several measures of spatial behavior.

Concerning the age group with which the present thesis is concerned, the preschoolers, some researchers have questioned whether or not children of this age are capable of forming a dominance hierarchy. For example, Edelman and Omark (1973) examined peer group hierarchies as they are "perceived" by children and came to the conclusion that preschool children do not form dominance hierarchies. They based this conclusion on their finding that in only 10 out of 20 dyads could dominance be determined through asking the children "who's tougher - you or x?", and through various other pencil and paper measures of dominance. However, this study was based only on the children's perceptions and not on actual behavioral observations. One can thus conclude many things. For instance, it might mean that the tests do not really reveal the true perceptions of the children or that the children are not capable of a cognitive representation of the dominance hierarchy. However, this does not necessarily mean that they do not behave in a dominant/subordinate fashion.

Blurton Jones (1967:351) stated that "dominance says nothing useful about the social organization of the class of three to five year olds I observed". He goes on to state that dominance/subordinance may be useful only when looking at the behavior of very low ranking individuals. However, in later papers Blurton Jones (1972a: 277, 1972b:111) appears to have modified his position. For example, in discussing nonverbal communication in preschoolers, he stated that, "In child-child interactions, a great many variables, such as relative size and weight and poisition in the peck order, would also have to be taken into account" (Blurton Junes 1972a:277). Thus, he now appears to believe that dominance is a useful concept for preschool children.

Other workers have found that children in this age group are sensitive to individual differences in dominance and that these differences are quite stable over time (Gellert, 1961, 1962; Cates, 1939; and Hanfmann, 1935). Other researches have also found the concept of dominance hierarchy to be useful in describing preschool children's social behavior (McGrew, 1969, 1972: Knudson, 1973; and Waterhouse and Waterhouse, 1973).

The four core structural units of primate rank orders have analogies in preschool children's dominance behavior. For example, in primates males are usually dominant over their female counterparts. Anderson (1937) found males to be more dominating in young children as did Edelman and Omark (1973) in their study of children in nursery school through grade four. Omark et al (1973) replicated this finding on five to ten year old children living in Switzerland and Ethiopia.

Males also participate in more dominance interactions as is the case with nonhuman primates. McGrew (1969) studied a group of preschoolers in which males formed 70% of the group but were involved in 99% of the agonistic interactions. Waterhouse and Waterhouse (1973) report that in one group of preschoolers, boys were involved in 66% of the agonistic interactions while in another group they were involved in 80%, even though they formed only half of each group. This finding has also been replicated cross culturally; Blurton Jones and Konner (1973) found that for both London and Bushmen children, boys scored higher on aggression.

In turn, this greater aggressiveness of the males leads to their hierarchies being clearer and more stable. Both McGrew (1972) and Waterhouse and Waterhouse (1973) found that while male preschoolers could be ranked hierarchially, females could not be ranked either because they did not participate in enough agonistic interactions, or because their behavior was not uni-directional, i.e. first one girl wins then the other and so on. Knudson (1973) ranked both sexes hierarchially but found that the boys in the three groups she studied were easier to rank. Similarly, Edelman and Omark (1973) found that in eight of nine classes of children, boy-boy dyads had a higher percentage of established dominance than girl-girl dyads.

Again, as was the case with non-human primates, these sex differences in dominance behavior have their ontogenetic origins in the same-sexed peer groups where males in their rough and tumble play learn and practice dominance skills. Omark (1972) found that for children aged 3 - 9, boys tended to play with other boys while girls played with girls. Brindley et al (1973) and Knudson (1973) both report same-sexed play groups for preschool children and Knudson also found that males engage in more rough and tumble play. This sex difference in rough and tumble play has been replicated cross-culturally by Blurton Jones and Konner (1973) and Whiting and Edwards (1973).

The remaining core structural unit of primate ranking systems, that males and females form separate sex hierarchies, has been reported for preschool children only by Knudson (1973) which suggests that this may not be an important feature in their ranking systems. This could be due to the fact that sexual dimorphism is not as pronounced in human children as in some nonhuman primates, so the danger of females fighting with males is minimized.

Thus far in our consideration of human and primate dominance behavior we have been concerned only with the ontogeny of such behaviors. In the next section the phylogenetic or biological aspects of sex differences in dominance behavior will be discussed.

Biological Bases of Sex Differences in Dominance Behavior

Many researchers of sex differences in behavior have suggested that some of these differences may be due to biological factors. For instance, a great deal of research in endocrinology has led to the conclusion that the presence or absence of the male sex hormones, or androgens, during the critical period of brain organization and differentiation affects later behavior. There is a substantial tradition of research implicating male sex hormones in the aggressive behavior of many animal species. The presence of testosterone during critical periods of brain development is required for the appearance of normal adult male aggressive behavior. For example, the treatment of newborn female rats with the male sex hormone, testosterone, results in the abolition of normal female behavior and the exaggeration of male behaviors, particularly aggression. Similar results have been garnered from research on guinea pigs, hamsters, and mice (see Reinisch, 1974 for review). It appears that these hormones affect the brain in such a way that males are predisposed to learn aggressive behaviors more easily than females. This biological predisposition enters into a complex interaction with experiential factors to produce sexually dimorphic adult behavior.

We will now examine the nonhuman primate and human data to see what effect these biological predispositions have on the four core structural units of primate dominance systems that we outlined earlier.

In just the last decade research on the role of testosterone in the mediation of aggression has been extended to primates. Goy (1968) and his associates treated pregnant female rhesus monkeys with testosterone thereby masculinizing any females they gave birth to. Within a few weeks of life these masculinized female rhesus infants engaged in far more rough and tumble play and threat behaviors than normal females did. No normal control females equalled or exceeded the masculinized females in these behaviors. As adults, these females continued to show abnormally high threat behavior. Phoenix, Goy, and

Resko (1968) conclude that these results show that hormonal action early in an individual's development has profound effects on later behaviors such as aggression, fighting, and dominance.

In studies on captive groups of male rhesus monkeys, Rose et al (1971) found that plasma testosterone levels are correlated with dominance rank and frequency of aggressive behavior. In later experimental studies, they discovered that males, when allowed to become dominant, showed two to threefold increases in testosterone levels while when these males were later subjected to defeat, their levels fell 80% from baseline levels (Rose et al, 1972, 1975). These results give some indication of the complex interaction between environmental events and biological processes.

On the human level similar results have been reported from the few studies which have been done. Persky et al (1971) found that testosterone levels were highly correlated with a measure of aggression derived from questionnaire-like reports. Neither Kreuz and Rose (1972) nor Meyer-Bahlburg et al (1974), for male prisoners and students respectively, could replicate this finding. However, Kreuz and Rose did find that prisoners with histories of violent crimes in adolescence had significantly higher levels of testosterone than prisoners who had no history of violent crime. Also, since all of these studies used pencil and paper measures of aggression and not actual observations, they are hard to evaluate. For example, Ehrenkranz et al (1974) found no significant correlation between testosterone levels and psychological measures in a group of male prisoners. However, on the basis of personal observations carried out over a period of years, 36 prisoners were categorized as either chronically aggressive, socially dominant but not aggressive, or not dominant and non-aggressive. They then found significant relationships between testosterone and aggression, and social dominance. The chronically aggressive and socially dominant prisoners had higher levels of testosterone than the non-aggressive/non-dominant group. This study clearly shows the importance of actual behavioral observations in such studies.

Sex and ethnic differences in testosterone levels have also been reported. Money and Ehrhardt (1972) note that adult males have ten times as much testosterone as females and Lunde and Hamburg (1972) note that there are sex differences in these levels from birth onwards. Briggs and Briggs (1972) found differences in the testosterone levels of men and women of European, African, and Asian origins living in Zambia, Africa. One could speculate that perhaps cross-cultural differences in aggression may be partially caused by corresponding endocrine differences.

The experimental work on masculinized rhesus females also has its counterpart on the human level. Money and Ehrhardt (1972) have studied groups of human females who have been masculinized _in utero_ either because their mothers received androgens as a treatment to prevent threatened miscarriages or because they suffered from a congenital disorder of the adrenal cortex. These girls were born with genitals which resembled those of boys, but they were surgically feminized at an early age and they grew up to see themselves as girls, as well as to be seen as girls by people who came into contact with them. When these girls were matched with, and compared to, a carefully selected group of control girls, a number of behavioral differences were found. The fetally androgenized girls, more so than the control girls, regarded themselves as tomboys, engaged in more vigorous activities, preferred to join in with boys in their energetic play, showed more dominance behavior, and so on. Money and Ehrhardt explain their "tomboyish" behavior as a sequel to the masculinizing effect of the excess androgens on the fetal brain. These prenatal determinants are later incorporated with postnatal socialization experiences and exert an important influence on gender activity and behavior.

To conclude this section, we can see that the four core structural units of primate hierarchies, identified earlier, especially the sex differences incorporated in these principles, may be partially determined by biological factors. In the case of the higher primates including man, endocrine influences on behavior are diluted by social and experiental factors but even on this level behavior is the product of the interaction between biological and environmental variables. The prenatal hormones affect the ease of learning certain behaviors such as aggression and dominance. Learned cultural behavior does not represent a break with biology but is rather involved in a complex interaction with it. As Larsen (1973) notes, culture and testosterone are in remarkable agreement as to sex differences in behavior.

In the following sections we will examine the effects of dominance rank and sex on proxemic behavior.

The Effects of Dominance Rank and Sex on Microspatial Proxemic Behavior

In this thesis five microspatial proxemic variables are examined. Here we will review the literature to see what effects rank and sex have on each of these variables. The five variables are: (1) interpersonal distance; (2) body orientation; (3) eye contact; (4) tactile contact; (5) voice loudness.

The first variable, interpersonal distance, refers to the distance between two interacting organisms. Several authors have noted that there is a close connection between personal space and rank. Leyhausen (1971) sees personal space as a status symbol; the size of an area around an individual is often a precise indicator of the rank that the individual holds. The observation that dominants have larger personal spaces has been noted for many animal species. For example, Gibson (1968) found this for fish, while on the primate level this relationship has been noted for langurs (Jay, 1965; Richards, 1974), and for Japanese monkeys (Alexander and Bowers, 1969; Yamada, 1971). This concept of "dominance distance" also forms a major part of Chance's (1967) theory on primate rank orders. He holds that social relationships are to be understood from the way individuals orient themselves spatially. Dominant males act as sources of both pain and pleasure and their being a source of pain leads to equilibriatory techniques or spacing out to decrease the possibility of pain.

Sex differences in interpersonal distance have been noted in many primate studies. Bernstein (1971) studied the spatial behavior of ten different species of old world primates and found that in nine of these groups females tended to use less space in social interaction than males. Kummer (1974) found that females also used less space in gelada baboons and patas monkeys.

Many of these findings are also common on the human level. The influence of rank or status has been noted in many studies. Engebretson and Fullmer (1970), using semi-projective methods, found that in the three cultural groups they studied, a figure designated "professor" was placed at a greater distance than figures termed "friends" or "relative". They found relationship to be a powerful determinant of personal distance. Barash (1973) observed more spatial equilibriation in students who were approached by a high status individual than for students approached by individuals of lower status. Hudson _et al_ (1972) examined preschool children's spatial behavior in terms of Chance's (1967) conception of attention structure and found dominance to be an important factor in their behavior. King (1966) noted that the ratio of "friendly" to "unfriendly" acts was strongly related to personal distance in an experimental situation among preschool children. Also, a reworking of his data[2] shows that the average approach distance in dyads with established dominance was greater than for dyads without established dominance.

Studies concerning external sources of threat, which is somewhat similar to dominance, also show similar results. Guardo (1969) found that school age children used greater distances when one figure was termed "feared peer" than with figures designated "friend", "acquaintance", and so on. Kinzel (1970) notes that violent male prisoners require larger personal space zones than non-violent inmates.

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[2]King (1966:112) gives a table which shows the data that he collected on each dyad. Thirteen of twenty six dyads showed established dominance which was determined by very short observations of unspecified "friendly" and "unfriendly" acts. The table was rearranged to give comparisons between dyads with established dominance and those without.

As in the nonhuman primate case, sex differences, with females using less space than males, have been reported for humans. Evans and Howard (1973) in a review of personal space studies, note that one of the few general findings of many researchers is that adult females use less personal distance than males. However, mixed results have been reported by investigators of this relationship on children.

Aiello and Cooper (1972) and Omark (1972) did find that females use less space in grade school children of various ages, while Guardo (1969) and Guardo and Meisels (1969) likewise found that they used less space than boys under positive affect conditions but more under negative affect conditions. Pedersen (1973a), using a simulation measure, also found that females used less space between grade two and six, but that there were no sex differences in the earlier grades. Aiello and Aiello (1974) also report a similar developmental trend for sex differences in six to sixteen year olds, and they argue from this that sex differences will be minimal among young children. This is supported by Eberts and Lepper (1975) and McGrew and McGrew (1972), who found no sex differences in nursery school children. On the other hand, Beach and Sokoloff (1974) report that males, and not females, used less space in the preschool children they studied, as did Bass and Weinstein (1971) for five to seven year olds, although the sex differences in the latter study were not pronounced. Strawbridge (1974) also could not replicate the adult sex difference of females using less space on grade school children.

Cultural or subcultural differences further cloud the issue. Baxter (1970) found that female children used less space in Mexican Americans, but the opposite was true for black children. Jones and Aiello (1973) and Aiello and Jones (1971) report similar confounding results.

We can see from this review of personal space research that there exists a substantial lack of consistent findings, especially regarding the effect of sex on proxemic behavior. Also, data from preschool children is very meagre.

The second microspatial proxemic variable is body orientation, this refers to the relation of the axis of one person's shoulders to another's; that is, how directly they are facing one another. Much less research has been done on body orientation than personal space, but some studies have examined the effects of rank and sex on this variable.

McBride et al (1963) note that in domestic hens two birds approaching one another tend to avoid each other's frontal aspect which is considered to be a defensive measure. Ripley (1970) observed that in langur monkeys if two individuals came face to face during feeding, an agonistic interaction might well occur. She further notes that langurs use a less direct body orientation to avoid social contacts. Van Hoof (1971) sees turning the back as a form of avoidance in chimpanzees. Finally, Poirier (1970) notes that subordinate langurs turn their backs to dominants. On the topic of sex differences in body orientation, the animal behavior literature has little to offer.

On the human level, Hall (1963:1009) notes that body orientation is linked with "the social setting and the age, sex, and status of the two parties". However, very little empirical work has been done on these variables and what little has been done has come up with contradictory results. For example, Barash (1973) found that college students turned away when approached by a high status individual, while Mehrabian (1969) notes that body orientation directed at a high status person was more direct than that used when interacting with a lower status person.

In a similar vein, Guardo (1969) found that about 20% of the children she tested placed a figure representing themselves in a back-to-back body orientation with figures designated "feared peers", while Aiello and Cooper (1972) found that junior high school students who were positively disposed to one another interacted at a more direct angle than did negatively disposed dyads.

Concerning sex differences in body orientation, the literature also shows opposing findings. Jones (1971) studied four sub-cultural groups in New York City and found that females used a more direct body orientation in all four groups. Aiello and Cooper (1972) also found females to be more direct in a study of junior high school students. However, developmental studies show somewhat different sex differences. For example, Aiello and Aiello (1974) found that males were slightly more direct in grade one but that females were more direct at the other grade levels. Aiello and Jones (1971) also found males to be more direct in grades one and two, but Jones and Aiello (1973) reported that males were less direct in black first to fifth grade children. The only study concerning body orientation in preschoolers found no sex differences (Beach and Sokoloff, 1974) although they used a very general measure of direct/nondirect orientation. Clearly, more research is needed on sex differences in children's body orientation to help clarify this issue.

Body orientation is closely related to the third microspatial proxemic variable, eye contact, which has probably been the subject of more research than any other proxemic variable.

In many nonhuman primates, direct eye contact functions as a threat behavior while averting the gaze is submissive and perhaps acts as an appeasement gesture. This has been found for langurs (Jay, 1965), baboons (Hall and Devore, 1965), gorillas (Schaller, 1965), and chimpanzees (Goodal, 1968), among other species. Rowell (1966a) similarly reports that 76% of stares followed the pattern dominant threatens subordinate. Vine (1970) comments that a stare during threat appears to be an homologous behavior for a wide range of primate species.

However, while direct stares usually follow the pattern dominant stares at subordinate, a central part of Chance's (1967) "attention structure" model of primate rank orders is that subordinates should look at dominants more. For example, Richards (1974) reports that subordinates frequently glance at the dominant male while Mitchell (1972) also found that monkeys glance nervously at dominants but that they look away to avoid direct eye contact. Thus, we can see that the duration of a look is very important and is associated with different behavioral states. This often leads to problems because using naturalistic observation methods, a stare and a glance are often very difficult to differentiate.

Sex differences have been reported in nonhuman primate looking behavior. Rowell (1966a) reports that in her study group of baboons, facial threats involving stares are more common among females than males. Mitchell (1972) and Thompson (1974) both report that in rhesus monkeys females look more frequently than males and this sex difference appears as early as three months of age. Mitchell also notes that females elicit more looks than males.

Once again, these results have parallels on the human level, but again there are ambiguous findings. Staring also functions as an aggressive signal in human adults (Ekman, 1972) and children (Blurton Jones, 1972a). Ellsworth et al (1972) found that staring elicits avoidance and acts as a threat display while Hutt and Ounsted (1970) remark that gaze aversion in autistic children functions as an appeasement gesture. Cross-cultural data also support the hypothesis that staring is a threat behavior in man. Watson (1970) reports that his African, Asian, and Indian-Pakistani informants stated that eye contact conveys aggression and would not be used in interactions with high status individuals. Hall (1974) points out that among the Navajo direct gazes imply hostility while for the Bushmen staring is considered rude and abhorrent (Thomas, 1959).

Eye contact has also been related to dominance. Thayer (1969) reports that recipients of long looks rated an experimenter higher on dominance than did recipients of shorter looks. Argyle et al (1974) found that a continuous gaze was rated highest on dominance while his subjects rated the zero gaze situation lowest on dominance. Sommer (1967) reports that little direct eye contact is made with dominant individuals at close quarters, while Strongman and Champness (1968) found that dominant individuals won staring encounters more often than subordinates. However, both Mehrabian (1969) and Exline (1972) report that individuals use more eye contact when interacting with high status people than with lower status individuals. But, Mehrabian did note that liking was also involved so it could be that, as was the case with the primate data, that different types of eye contact are associated with different motivational states. In fact, a number of researchers have suggested this. For instance, Argyle and Dean (1965) argue that there are "approach and avoidance" forces behind eye contact, while Kendon (1967) speaks of "expressive and monitoring" functions and Exline (1972) of glances of "power and preference". Theoretically these distinctions are easy to make, but empirically the distinction is not so clear. For example, Kendon (1967) reports that mutual gazes are usually only about one second in duration. If looks are this brief, how is one to determine the motivations inherent in them, especially when one leaves the laboratory to do field observations?

Nevertheless, some authors do report results which seem to support these motivational distinctions. For example, Omark (1972) found that in first grade children dominants were more likely to win staring encounters than subordinates, but he also reports that low ranking children look at dominants more than vice versa. Waterhouse and Waterhouse (1973) also report this latter finding which shows that Chance's (1967) "attention structure" model works on the human level as well. Omark's data also suggests that there do exist both approach and avoidance tendencies in eye contact.

In the area of sex differences in eye contact, the results are more conclusive. Ellsworth and Ludwig (1972:379) state, "In research on visual behavior, sex differences are the rule, rather than the exception". Adult women have usually been found to engage in more eye contact than men (Argyle and Dean, 1965; Aiello, 1972; Exline, 1972; and Watson, 1972), while adult males have been found to avoid more eye contact than females (Argyle and Dean, 1965; Exline et al, 1965).

These results have also been replicated on children, but there is some conflicting data as to when this sex difference first appears. Russo (1975) found that for children in kindergarten - grade six females engaged in more eye contact than males. However, Post and Hetherington (1974) found no sex differences in the judgment of eye contact and affiliation in four year olds, but by six years of age girls are using the cue better than boys, which suggests that this sex difference is not prevalent in the preschool years. This is supported by Beach and Sokoloff's (1974) finding that there were no sex differences in preschool children. However, some circumstantial data suggests that female preschoolers may engage in more eye contact than males. Ashear and Snortum (1971) found that preschool females used more eye contact when conversing with an experimenter than males. Also, Eberts and Lepper (1975) found similarities between adults and preschoolers in the relationship between eye contact and interpersonal distance, which suggests that other findings from adults, such as sex differences, may also operate on the preschool level.

Since primates are what Hediger (1968) would call "contact animals", they provide a great deal of information on relationships and tactile contact. Concerning rank, it has often been found that dominants determine the amount of physical contact which takes place in a social interaction. Subtle dominance interactions may involve the use of light touches in chimpanzees (Goodal, 1968), gorillas (Schaller, 1965), and langurs (Jay, 1965). Rowell (1966a) found that in captive baboons, 71% of touches followed the pattern dominant touches subordinate, while Bernstein and Sharpe (1966) report that the lowest ranking members of a rhesus monkey group had the lowest scores for contact. Similarly Talmage-Riggs and Anschel (1973) found that subordinate squirrel monkeys rarely initiate huddling with higher rankers and Weber (1973) observed that when subordinate langurs touch a dominant, this behavior is accompanied by expressions of strong fear. Thus, it appears that dominance is clearly associated with taking the initiative in contact behavior.

For sex differences in contact, Bernstein (1971) found that in nine of the ten different species of old world primates he observed, females engaged in more contact than males. Rowell (1966a) also found this for captive baboons. However, Nadler and Braggio (1974) found that males, rather than females, engaged in more contact behavior in captive chimpanzees and orangutans, so this relationship between sex and contact is not as clear as that for rank and contact.

Much less research has been devoted to human contact behavior, especially its relationship to rank. Henley (1973) argues that status differences are reinforced by non-reciprocal touching, that is dominants can touch subordinates but not _vice versa_. She found that males touch females more and interprets this as "indicative that touching is one more tool used by male supremacist society to keep women in their place" (Henley, 1973: 431). McGrew (1972) found that in preschool children, the most and least aggressive children show little physical contact. It is clear that, as Weitz (1974) points out, much more research is needed in this area before any conclusive statements can be made.

Sex differences in contact behavior have been studied in only a little more detail. Whiting and Edwards (1973) report that there are universal sex differences, with females engaging in more contact, for children aged three to six. Draper (1973) also reports that Bushmen girls engage in more contact then boys, as do the British college students that Jourard (1966) studied. However, Gattfried and Seay (1974) found that while young black females do engage in more contact at age three, males engage in more at age five. Again, more research is clearly needed.

For the final microspatial proxemic variable, voice loudness, the non-human primate data is of no help because verbalization is unique to man. On humans little research has been done on this variable by proxemicists. Concerning rank differences, Mehrabian (1971) argues that submissive people have softer voices than dominants while Argyle <u>et al</u> (1970) feel that "a loud dominating voice" is used to communicate superiority. There is also some cross-cultural data that bears this out. Watson's (1970) Asian informants felt that raising the voice conveys anger, while Indian-Pakistanis reported that it conveys an attempt at dominance. Hall (1974) similarly reports that a loud voice signals anger to the Navajo.

On sex differences, Watson (1972) found that white males used a louder voice than females. No proxemic studies have reported sex differences for preschoolers but Omark (1972) found that little girls talked more while Gottfried and Seay (1974) found just the opposite to be true of rural black children.

This completes our review of research on microspatial proxemic behavior. From this review two general conclusions can be made: (1) that the effects of dominance rank and sex on human proxemics are far from clear; and (2) there is a lack of data regarding the effects of these two variables on preschool children's proxemic behavior which retards the study of the development of proxemic behavior.

In the next section the effects of rank and sex on macrospatial proxemic behavior, that is the use of space on the larger physical environmental level, will be examined.

The Effects of Dominance Rank and Sex on Macrospatial Proxemic Behavior

On this level five variables will be discussed in relation to rank and sex. They are: (1) freedom of movement; (2) avoided areas; (3) monopolized zones; (4) jurisdictional or territorial behavior; and (5) relative dominance.

The first two variables, freedom of movement and avoided areas, are quite similar to one another so they will be discussed together. Calhoun (1962a) and Barnett (1958) both found that dominant rats visit more locations in their everyday activities and have more freedom of movement than subordinates. McBride (1964) and Wood-Gush (1971) also both report that dominant chickens move freely through the environment while subordinates are restricted to smaller areas. This differential mobility according to rank has also been reported for nonhuman primates. Both Chance (1956) and Poirier (1970), for rhesus monkeys and langurs respectively, note that dominants move about more freely than subordinates. Yamada (1971) found that Japanese monkeys have a central-peripheral structure with the dominant males and females in the centre of the troop with lower ranking members being situated on the troop's periphery. These lower ranking members avoid the central part of the troop while more dominant monkeys roam at will throughout the troop. Lindberg (1971) and Southwick et al (1965) also found this structure to be characteristic of rhesus monkey groups. Alexander and Bowers (1971) reported that this central-peripheral structure was not present in captive Japanese monkeys but Alexander (Alexander and Roth, 1971) does note that subordinate males probably still observe spatial restrictions. Subordinates have also been found to be spatially restricted in captive pigtail monkeys (Jensen and Tokuda, 1974) and captive siamangs and gibbons (Fox 1972).

Chance (1967) points out that this lack of mobility placed on subordinates restricts the availability of what the environment can offer them. For example, in the Japanese monkeys the subordinates avoid the troop's centre where much of the breeding takes place, so their ability to reproduce may be impaired. Thus, this differential mobility according to rank may be both naturally and sexually selected for.

Sex differences in these macrospatial variables have also been reported. Kaufmann (1974) notes that adult male whiptail wallabies have larger home ranges than females. Menzel (1969) found that in captive chimpanzees males covered more space than females and Kummer (1971) argues that for primates in general males are more prone to wander and explore in space. However, Coe and Rosenblum (1974) found that in squirrel monkeys females had more spatial mobility than males, which indicates that the sex difference Kummer proposes is not conclusive.

Sommer (1969), Mehrabian (1971) and Hall (1971) all argue that this principle of differential mobility according to rank holds for humans as well but they cite no empirical proof of this and only a few such studies have been carried out on humans. Esser et al (1965) found that high ranking adult male mental patients had more freedom of movement than middle and lower ranking individuals who avoided more areas than dominants. Fleising (1973) replicated this finding on adult male prisoners. No research exploring this relationship has been done on preschool children.

More literature on sex differences in human macrospatial behavior is available. Among young children, boys are often more active and exploratory than girls (Goldberg and Lewis, 1969; Hutt, 1972; and MacCoby and Jacklin, 1974), while both Omark (1972) and Harper and Sanders (1974) found that males from preschool to grade two use more space in outdoor play than females. Also, Whiting and Edwards (1973) note that studies done in Kenya and Guatemala found that young girls had less spatial mobility than boys.

Biologically based sex differences partly account for some of these results. Hutt (1972) points out that males have structural and functional features (i.e. larger hearts and lungs, stronger muscles, etc.) which equip them for a more active life than females. Endocrine differences are also involved for when adult females are injected with androgens, the male sex hormones, they experience an increase in activity (Bardwick, 1971). Also, Money and Ehrhardt (1972) found that hormonally "masculinized" females are more active than normal females. However, cultural differences in socialization also play an important part in this sex difference. For example, Blurton Jones and Konner (1973) found that while English boys were more active than girls, there were no sex differences in Bushmen children.

The third and fourth macrospatial proxemic variables, monopolized zones and jurisdictional or territorial behavior, will also be considered together.

The concept of monopolized zone was introduced by Jewell (1966) to refer to the situation where the home ranges or core areas of different groups or individuals do not overlap and are used exclusively by those groups or individuals but are not defended as territories are. This concept has been used primarily to describe between-group behavior and has only rarely been applied to intra-group spatial behavior. However, some findings of other researchers bear some similarity to Jewell's concept. For example, Calhoun (1962a) notes that in his experimental colony of rats, the dominant male took over an area of the pen and had exclusive access to the area and the females it contained. For primates, it is generally found that where there is competition for desirable areas, they are most often occupied by dominant individuals (Stynes et al, 1968; Bramblett, 1970).

The concept of monopolized zones has not been used in human spatial research but Sundstrom and Altmann (1974) found that high ranking individuals in a group of teenaged boys used the desirable areas of their environment more often than others. No sex differences in monopolized zones have been reported for humans but this is not surprising in view of the fact that virtually all of the research on macrospatial behavior has been on all male groups in psychiatric hospitals, prisons, reform schools, and so on.

The English naturalist, Howard (1920) is generally recognized as the person who introduced the concept of territory, or defended area, to the field of animal behavior. Howard first described this behavior for birds, but the concept became popular very quickly and has now been applied to a vast range of species, from fish to man. Carpenter (1964) notes that territoriality is almost universally exhibited by all animals in some form or other which suggests that it probably has been an important factor in animal evolution. He offers more than thirty survival functions which territoriality has been inferred to provide for many species.

Dominance and territoriality are often interrelated with high ranking individuals commonly defending larger territories than subordinates (Wynne-Edwards, 1962; Noble, 1939). It is also commonly found that males are more active in territorial defense than are females (Bates, 1970; Carpenter 1964).

In the study of human territorial behavior there has been a heavy reliance on animal data and theory. However, in animal behavior the term territorial behavior is almost always used to denote a defended area. The criterion of defense is central to the concept but many authors use this term in describing human macrospatial behavior where active defense has not been found. For example, Altman (1970) and Edney (1974) in reviews of human territoriality both note that the criterion of defense is rarely used in studies on humans and they condone this use of the concept. I would argue that if defense is taken out the concept of territoriality loses its meaning and usefulness. There are numerous other concepts in the animal behavior literature (i.e. home range, core area, foci of activity, monopolized zones, etc.) which better describe the behaviors being termed territorial in humans. Where this is so these other terms should be used in place of territoriality. This will become clearer as the review proceeds.

The most prolific investigators of human territorial behavior have been Aristide Esser and his colleagues. A number of his studies have investigated the relationship between dominance and territoriality and have come up with contradictory results. Esser et al (1965) studied territoriality in male mental patients and found that lower ranking patients defended territories while dominants did not. However, territoriality was defined only in terms of frequency of use of certain areas and not in terms of defense, so Kaufman's (1962) concept of core area, or areas predominantly used, is more applicable than territory in this case. In later studies Esser (1968, 1970, 1973) used both frequency of use and defense in defining territoriality so these studies do fall under the rubric of territory. For six - ten year old psychiatrically hospitalized boys, he found that most territorial holders were medium and low rankers (Esser 1968) while for adult male mental patients, this was also the case (Esser 1970). However, in another study on nine - fourteen year old boys, territoriality was found only for high rankers (Esser 1973). Sundstrom and Altmann (1974) also found dominance to be associated with territorial behavior in a group of teenage juvenile offenders but they defined territoriality as exclusive or habitual use of particular areas so their results fit under the concepts of core area and monopolized zones better than under the classic conception of territory. We can see that the relationship between dominance rank and territorial behavior is unclear and needs to be further studied using better defined concepts and measures.

Territoriality is also influenced by sex in humans. Edney and Edney (1974) found that female groups had smaller territories than males, while

Sommer (1969) notes that males are more likely to invade territories than are females. Knudson (1973) likewise found that among preschoolers, males are more involved in territorial acts than females. However, Cheyne and Efran (1972), in a study of group controlled territories, found that female-female pairs were better defenders than male-male pairs. Nevertheless, on an individual basis, males would be more expected to engage in more territorial behavior than females.

Some observers have argued that preschool children do not show territorial behavior (Blurton Jones, 1967; Castell, 1970) but other authors have described it for this age group (Hutt and Hutt, 1970; Knudson, 1973; Zegans, 1967), although no detailed studies of this behavior have been done on preschool children.

As we have seen, the concept of territoriality has been used very loosely in studies on humans. Becker (1973) argues that Roos' (1968) concept of jurisdiction, or temporary defense of some space or object, is more appropriate for describing human spatial behavior than territoriality because it makes fewer assumptions about the occupants relation to the space he is using and about the underlying origins of his attachment to that place. Also, a central part of Altman's (1970) definition of human territoriality is that territories are temporally durable. Because of the misuses of the concept of territoriality discussed earlier and since a pilot study on a group of preschool children done in January-February 1974 failed to discover temporally durable territories, the concept of jurisdiction was used in this study in place of territoriality.

The final macrospatial variable to be considered is relative dominance. Leyhousen (1971) notes that the outcome of agonistic interactions, and hence the dominance hierarchy, often depends on the location of the fight (i.e. in whose territory the fight occurs). He terms this ranking relative to spatial location, "relative dominance". Lorenz (1966) likewise notes that in many animals readiness to fight is greatest in the most familiar place, usually the hone base or territory, while as the distance from the home increases the readiness to fight decreases. This relative dominance has been reported for captive groups of rhesus monkeys (Marsden, 1969) and wild langurs (Poirier, 1968). Leary and Maroney (1962) also found that in captive monkeys an individual's dominance rank was higher when tested in his home cage than when he was a guest in another's cage.

Relative dominance has been reported in only one study on humans. Esser (1970) found that in the group of male mental patients he studied, some individuals had a power to dominate others within their own territory beyond that which their overall dominance rank would indicate. The territory holders won 87.5% of the fights within their territories and only 55% outside of their dominance. However, Noble (1939) concluded that, for birds, territories have clear advantages for subordinates because they can dominate higher ranking birds there. Edney (1974) on this point notes that territory acts as a "social equalizer" for lower ranking animals. In this thesis the concept of core area was substituted for territory or home base because preschooler's territories are probably not temporally durable and also because this term more closely resembles Esser's criterion of territory.

This concludes our review of macrospatial proxemic behavior. As we have seen, research regarding the effects of rank and sex on macrospatial behavior needs further study. Also, very little data is available on this aspect of preschool children's behavior. For example, Edney (1974), in a recent review of human territorial behavior, explicitly calls for more research on sex differences in territoriality as well as developmental studies.

Theoretical Background

Evans and Howard (1973), Edney (1974) and Altman (1970), in recent reviews of human spatial behavior all come to the conclusion that there is a paucity of theoretical discussion concerning personal space and human territoriality and that both fields still lack full-fledged theories. Because of this, one has to be eclectic and draw on theories from related disciplines. In this thesis, three primary theoretical precepts will be used: (1) an ethological orientation; (2) social learning theory; and (3) Mehrabian's (1971) "power metaphor" of nonverbal communication.

The ethological orientation consists of two interrelated parts: (1) the use of ethological methods and concepts, and (2) the use of a cross-specific evolutionary framework. Ethological methods of observation stress the importance of direct observation of naturally occurring behavior as opposed to observations done in laboratories or studies using pencil and paper measures of behavior. The use of these latter two methods has caused problems for researchers of personal space. For instance, some studies have found correlations between simulated measures of personal space and actual personal space measures under laboratory conditions (Little, 1965), but others have found that simulated measures do not predict the actual distances used in laboratory social interactions (Dosey and Meisels, 1969; Pedersen, 1973 b and c; Mallenby, 1974). Bass and Weinstein (1971:375) who used a simulated personal space measure, admit that "natural observations of children in the environment .... may be more fruitful than paper and pencil measures".

Reliance on verbal accounts of behavior and paper and pencil measures has also caused problems in the study of children's dominance hierarchies. For example, these measures were used by Edelman and Omark (1973) and caused many difficulties. They found that boys generally overrated themselves when comparing themselves to others. When asked "who's tougher, you or X?" they answered only on the basis of their own present feelings and not on past experiences. They also expressed doubts as to whether or not the preschool children even fully understood the tests to which they were subjected (Edelman, 1973). Also, no attempts were made to determine if the children's self perceptions bore any relationship to their everyday behavior.

While these experimental tests and verbal reports are useful in some ways, a solid baseline of data is needed so that the results of these tests can be compared to naturalistic behavior to see if there are any correlations. The results from experimental data are of little value without this baseline data gathered by direct observation. For these reasons ethological methods of observation were used in this research.

A number of ethological concepts were also utilized in this research. Animal ethologists have been studying nonverbal behavior for many years and have developed tools of investigation and concepts which can be applied to the study of the human animal (Tiger and Fox, 1966). Ethological methods and concepts have been profitably utilized in the study of Western preschool children (Blurton Jones 1972c; McGrew, 1972), in cross-cultural studies of children and adults (Konner and Devore, 1974; Katz, 1974), in the study of psychiatric patients (Hutt and Hutt, 1970b), as well as male prison inmates (Pfeiffer et al, 1974; Fleising, 1973).

The use of ethological methods and concepts facilitates cross-species comparisons. Callan (1970) argues that by comparing and analyzing the logical possibilities of social organization in different species, we may hope to end up with a set of mininally defined, possibly interlinked, concepts which would form the basic units of an analysis of all social organizations. A good example of this approach is Mazur's (1973) cross-specific analysis of status in small groups. By studying species other than man, we may be in a better position to get the "deep structures" (3) that underlay human social systems.

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(3) This term is borrowed from Chomsky's (1968) linguistic scheme. He uses the term to refer to the general, underlying principles that restrict and condition language and which are rooted in man's phychobioligical makeup.

Kummer (1971) notes that we probably have inherited some of our spatial behavioral repertoire from our prehuman ancestors. This thesis is based on the assumption that there are phylogenetic continuities in dominance and spatial behaviors between human and nonhuman primates. An evolutionary framework is useful for determining which kinds of questions need to be asked about human behavior. Primate studies are particularly useful for suggesting hypotheses which can be tested for generality on humans. This last point, that hypotheses derived from animal behavior must be tested on humans and not directly analogized, needs to be emphasized since human ethology has often been criticized as being reductionistic (i.e. Montagu, 1968). In fact, just the opposite is true, biological analyses of behavior involve the addition of new factors to the research strategy and not the replacement of traditional ones (Tiger, 1975). Thus, through the use of ethological methods and concepts, along with an evolutionary framework, we may hope to be able to pinpoint similarities and differences between human and nonhuman behavior.

The second theoretical perspective is Baldwin and Baldwin's (1974) "social learning theory of spacing" which is derived from behavioral psychology. In view of the fact that an ethological formulation has already been presented and because of the view held by many that ethology and behavioral psychology are in opposition to one another, a few points should be made here. Recent research in the area of learning theory is showing that learned cultural behavior does not represent a break with biology but rather is involved in a complex interaction with it. For example, Seligman and Hager (1972a and b) emphasize that there are limits and predispositions to learning which have been set by the species phylogenetic history. An animal's evolutionary history has the effect of making some things easier to learn than others, some more difficult to forget, some more generalizable and so on. Learning is not a random process, "the learning apparatus of men and animals may be just as evolutionary specialized as perceptual and motor apparatus", (Seligman and Hager, 1972a:87). Skinner (1974) likewise agrees that operant conditioning is a part of an animal's genetic endowment. What has been naturally selected for, and inherited, is the ease of susceptibility to operant conditioning. This scheme has the side effect of nicely resolving the sterile nature/nuture dichotomy for learning now becomes continuous with instinct, "instinct" simply represents an extreme case of evolutionary preparation for learning.

With these points made, we may return to the Baldwin's theory of spacing. They hold that in the different types of social interactions that an animal experiences, it will receive different combinations of reinforcers and punishments depending on the interaction distances used. This results in a situation in which animals will use small personal distances when interacting with animals associated with positive reinforcement, while animals who receive negative reinforcement should use greater distances. Now when interacting with different individuals of a group,differential treatment according to distances maintained can be expected. For example, a subordinate would likely receive a different response if he approached a dominant very closely than if he approached another subordinate in the same way (i.e. a dominant would be more likely to inflict physical punishment than the subordinate). Thus, since differential treatment according to rank is probable, dominants and subordinates would be expected to maintain different distances. Animals would be more likely to have aversive encounters with dominants so would be conditioned to maintaining larger distances when interacting with higher ranked individuals. Interactions with lower ranked animals would likely be more positive, as the fear of physical punishment is lessened, leading to smaller distances. Thus, each individual would be expected to maintain different individual distances vis-à-vis other individuals depending on past socialization experiences. McBride (1973) notes that a summary of this past behavioral experiences is carried forward into each new encounter. He uses the term "relationship" to refer to this mutual residue of past behavior. One such relationship variable is dominance rank.

This social learning theory fits in nicely with the ethological emphasis on the functional aspects of behavior (Vine, 1973). Evans and Howard (1973) have suggested that personal space aids in the control of aggression. Subordinates, for example, by keeping their distance from dominants, use personal distance as a kind of "body buffer zone" thereby minimizing the likelihood of physical damage being inflicted upon them. The social learning model also partly subsumes other theoretical models of spacing behavior. For example, both Altman and Lett's (used by Watson, 1970) and Leibman's (1970) models emphasize that personal space is a psychological variable which intervenes between antecedent factors or conditions and consequent interpersonal behavior. That is, past behaviors serve to define the situation which in turn affects the behavior that presently occurs. In social learning terms, this means that an individual's previous history of conditioning leads to differential spacing according to the relationships previously established. The social learning theory also embodies aspects of Chance's (1967) model of primate spacing behavior. A major part of his attention structure model is his concept of spatial equilibration, or the adjustment of distances between one individual and another so that the balance of attractive and repellent forces are maintained. A dominant animal can act as a source of both pain and pleasure. Where aggression is predominant, other animals space themselves out and away from the dominant, while where pleasure is involved, as in say grooming, lower rankers use small distances. We can see that a negative reinforcement (i.e. the dominant's aggressiveness) leads to greater personal distances, while positive reinforcement (i.e. pleasure of grooming) leads to smaller distances.

The third theoretical postulate to be used, Mehrabian's (1971) "power metaphor" is really only an hypothesis as he offers little empirical data to support the principle. In fact, this thesis can be seen as a test of Mehrabian's hypothesis. Mehrabian believes that nonverbal behavior communicates feelings which can be classified along three dimensions; like-dislike, status or dominance, and responsiveness. Each of these feelings is represented by a "metaphor", the three metaphors are: immediacy, power, and responsiveness. The "power metaphor" holds that the higher status person in an interaction is the party which determines the degree of intimacy which will prevail in that interaction. For example, if tactile contact takes place the dominant party will be more likely to initiate it than the subordinate. Mehrabian argues that these metaphors are basic and transcultural.

These three theories; (1) the ethological orientation, (2) the social learning theory, and (3) the power metaphor, were used to derive hypotheses on preschool children's spatial behavior and will also be used in the discussion of the results of this study.

Hypotheses

From the review of the literature concerning the effects of rank and sex on proxemic behavior in animals and man, along with a consideration of various theoretical precepts, the following hypotheses were generated and tested on a group of preschool children.

(1) Dominants, since they would be expected to be more intimate and have less to fear, will use a smaller personal distance than lower ranked children.

(2) Girls will use less personal space than boys.

(3) Dominants will use a more direct body orientation than lower rankers.

(4) Boys will use a more direct body orientation than girls.

(5) Dominants will use more eye contact than lower rankers.

(6) Girls will use more eye contact than boys.

(7) Dominants will initiate more tactile contact and receive less than lower ranked children.

(8) Girls will engage in more physical contact than boys.

(9) Dominants will use louder voices than others.

(10) Boys will use a louder voice than girls.

(11) Dominants will have a higher level of intimacy than others.

(12) Girls will be more intimate than boys.

(13) Dominants will have more freedom of movement and avoid fewer areas than lower rankers.

(14) Boys will use more space than girls.

(15) Dominants will be more likely to occupy monopolized zones and jurisdictional behavior than others.

(16) Boys will be more jurisdictional than girls.

(17) If relative dominance occurs, it will be shown by subordinates.

CHAPTER III

METHODOLOGY

Research Setting

A field observational study was conducted in a St. John's day care centre which consisted of a number of rooms located on two floors. The preschool children confined their activities to two large rooms located on different floors (see Figures 1 and 2). In the figures each numbered area or square represents a subdivision of the larger space. The larger downstairs room (Figure 2) was designed for more gross motor activity. This room contained tricycles, sand box, play kitchen, gymnastic apparatus and other toys. The children were observed on mornings while they engaged in free play. Three female teachers were normally present.

Population and Sample

The study was carried out on a group of thirty four children aged 3 to 6, (mean 46.6 months, S.D. 6.3 months) who had been together for approximately four months prior to the start of this study. The group consisted of eleven boys and twenty three girls. Of the thirty four children, a varying number were present each day. The population was somewhat unstable as a number of children left the group for a time because of vacations, sickness and so on. A few children withdrew from

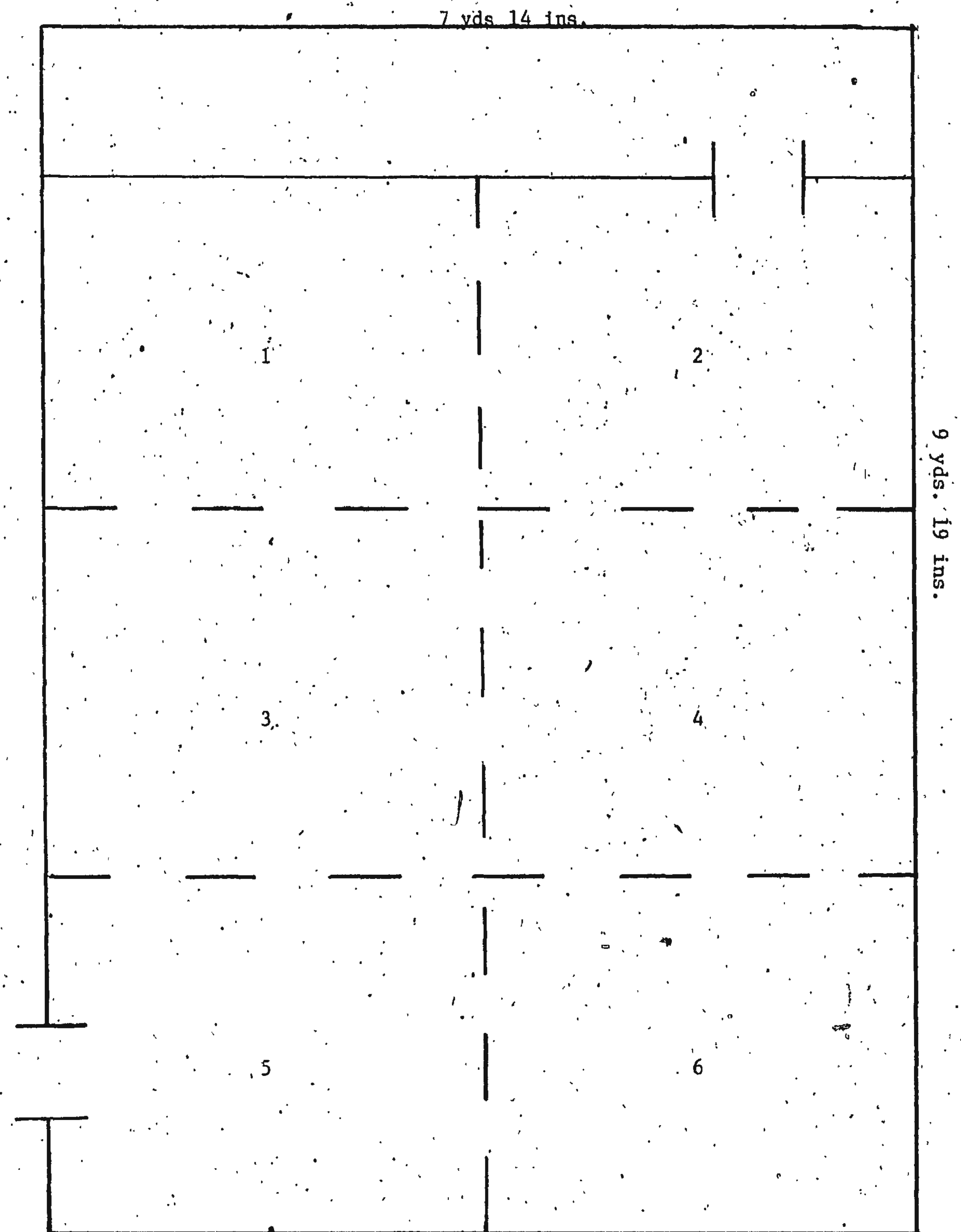


FIGURE 1 - MAP OF UPSTAIRS PLAY ROOM

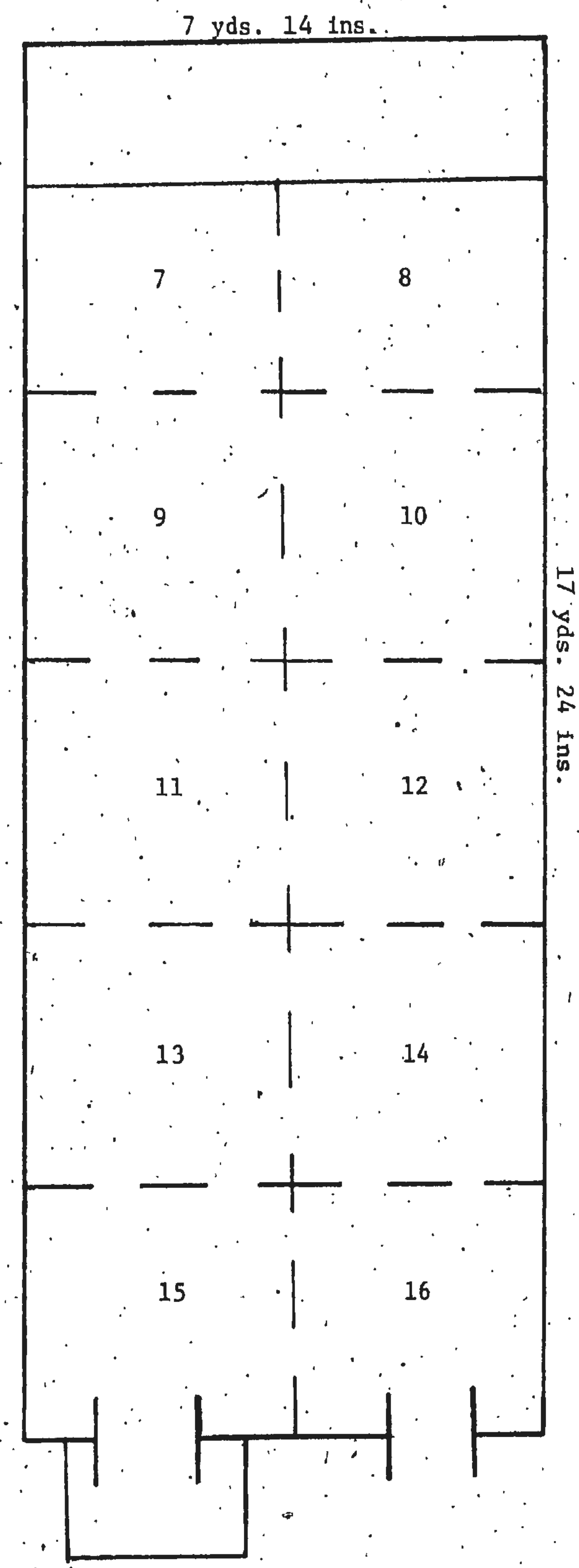


FIGURE 2 - MAP OF DOWNSTAIRS PLAYROOM

the nursery while the study was in progress and one new child was introduced a few days before the completion of the study.

The children's backgrounds were quite heterogeneous. Most were of middle and upper class backgrounds (i.e. fathers were doctors, professors, etc.) but a number of children came from lower class backgrounds. All children were white, except for one black child, and most of their parents came from mainland Canada, although others came from New Zealand, Czechoslovakia, Denmark, Scotland, England and the United States.

For the computation of the dominance hierarchy, the observations of jurisdictional behavior, and the ad lib contact sample, all thirty four children were observed. For the collection of the proxemic data nine children of each sex were chosen for observation, that is, eighteen children out of the total group of thirty four were observed. The original conception was to choose the three highest rankers, the three lowest, and the three medium rankers of each sex. However, in the boy's case, two children (those ranked second and sixth), withdrew from the group leaving a total of nine boys. This number was simply divided into groups of three high, three medium, and three low rankers. In the girl's case, the top six girls were designated dominants, the bottom six subordinates, while the remaining eleven were termed medium rankers. Of this number, girls ranked one-two-three, tenth-eleventh-twelfth, and numbers nineteen, twenty two and twenty three were chosen for observation. Number nineteen was chosen because the girl numbered twenty one left on vacation while number twenty only attended part time.

Data and Instruments

Four different sets of data were collected, all by direct observations: (1) dominance interactions; (2) microspatial proxemic behavior; (3) macro-spatial proxemic behavior; and (4) jurisidctional behavior.

The domanance data were recorded on prepared forms which showed the location of the dominance interaction, individuals involved, and outcome. The behavioral sampling method used was "ad lib" or event sampling (Altman, 1974); that is, the group was scanned and the appropriate behaviors were noted when they occurred. This method suffers from "differential observability" since some individuals or one sex may be more visible than others which would lead to biased data. Two methods were employed to counteract this flaw. First, observation time was divided equally between concentrating on male and female individuals or groups. This was done to ensure, as best as possible, that the agonistic behavior of both sexes was recorded equally. Secondly, "observability samples" were done; once during each hour of observation a two minute period was devoted to noting which individuals were present and hence being observed. This partly ensures that each child's scores would not be biased, i.e. scores on agonistic behavior could be compared to the observability samples to see if there were any biases due to their not being observed either enough or too much. Finally, some focal individual smapling (Altmann, 1974) was done on children for whom more data were needed to construct a domanance matrix.

The data on jurisdictional behavior were also collected on prepared forms showing the location of the act and individuals involved. The ad lib or event method of sampling was also used.

The microspatial data were collected on checklists. Individuals were randomly listed for observation and starting with the first individual a line of proxemic data was taken on that individual and the closest same sexed peer in the vicinity of whose presence the focal individual was aware. The behavior of the focal individual directed at the other person was recorded. The sampling method used was an instantaneous scan sample, the focal individual's current behavior at a specific moment was recorded (Altmann, 1974).

Preliminary practice observations showed that little data on tactile contact could be collected using this method so some ad lib or event samples were done to supplement the other observations. This consisted of scanning the groups and noting any physical contact that occurred.

The data on macrospatial proxemic behavior was recorded on maps of the nursery. The sampling method used was an instantaneous scan on focal individuals. Every five minutes the group was scanned and the spatial location of the focal individuals were plotted.

The dominance and jurisdiction data were collected between February 4 and March 5, 1975. Approximately thirty hours of observation were done and 328 dominance interactions and 65 cases of jurisdictional behavior were recorded. The microspatial proxemic data were collected between March 5 and April 9, with a total of 1,012 observations being made. This was preceded by a period of practice observations which were done from February 3-17. Finally, the macrospatial proxemic data were collected between March 10 and April 10, with 2,587 observations made.

Measures and Operational Definitions

Dominance, as used here, refers to the mutually respected rights one individual has over another (Kreveld, 1970). Dominance must be seen as a probabilistic concept and not as an absolute priority of one animal over another, i.e. the dominant does not necessarily win all fights but he will win appreciably more than another person. Indicators of dominance/ subordinance consisted of recording the frequency, directionality, and outcome of dyadic physical and verbal agonistic encounters. McGrew (1972:22) operationally defined agonistic behavior as consisting of the following:

> aggressive behavior (i.e. behavior which normally produces injury to or flight by the child to whom it is directed, e.g. attack, threat), fearful behavior (i.e. behavior by an aggressed against child which reduces damage or threatening; e.g. flight, submissive posture), and defensive behavior (i.e. behavior by an aggressed against child which prevents an aggressor's attack from being completed, but without either attacking in return or fleeing or submitting; e.g. retaliatory threat).

McGrew's definition was used in this research. Agonistic behavior is composed of the following behavioral units (after Smith and Connolly, 1972):

- Threat - threat of attack as indicated by verbal utterance (I'll hit you!) or by an expression or posture.
- Hit - hit or beat with an extended aim in an agonistic context. Contact is sometimes made but not necessarily so.
- Fight - agonistic behavior involving gross physical contact.
- Submissive - allowing another child to take possession of a toy or apparatus without any substantial attempt at resistance.

- Flight - locomotor behavior away from a threat or immediately after surrendering a toy or apparatus to another child (distinct from flee in a play context).
- Try to take toy - taking or attempting to take a toy (which has not been offerred) from another child.
- Try to keep toy - in response to another child trying to take a toy, holding on to the toy and/or following the child who has taken it, trying to get it back.
- Verbal command - positive (come here!) or negative verbal mandates (don't do that!) in an attempt to control another's behavior. Submission consists of complying with the commands (Gellert, 1961).

Winner refers to the child gaining or retaining possession of an object, giving commands that are carried out, or being the last to show submission. Loser refers to the child losing or failing to gain possession of an object, obeying commands, or being the first to show submission.

The microspatial proxemic data was measured through five variables: (1) personal distance; (2) body orientation; (3) eye contact; (4) tactile contact; and (5) voice loudness.

Personal distance - this category measures the distance between two people in terms of the potential to hold, grasp or touch. The categories are (after Watson, 1970):

1. Within body contact distance.
2. Just outside this distance.
3. Within touching distance with forearm extended.
4. Just outside this distance.

5. Within touching distance with arm extended.

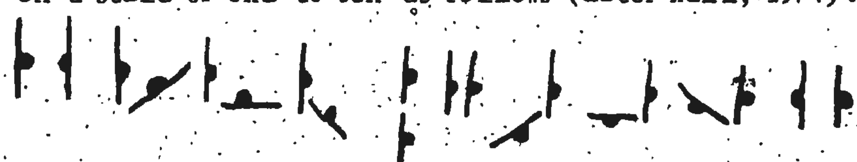
6. Just outside this distance.

7. Within touching distance by reaching.

8. Just outside this distance.

9. No potential for touch.

Body Orientation - this category measures the relation of the axis of one person's shoulders to that of the other. This is scored on a scale of one to ten as follows (after Hall, 1974):



1 2 3 4 5 6 7 8 9 10

Face to Face Back to Back

Eye contact - measures the amount and kind of visual communication:

1. Look at - gaze directed at another's face.

2. Look away - gaze directed away from another's face.

A more elaborate operationalization of this variable was originally planned but during the preliminary observations it was found that accurate observations of eye contact were very hard to make. Other researchers have had similar problems which led Vine (1971:326) to state that:

> in real life interaction we tend to give a direct eye gaze or to look well away from the face of the other person.. If this is the case, then observer judgment can be expected to be fairly adequate in studies where eye gaze vs no eye gaze is monitored.

Because of these difficulties the simple look at/away measure was used.

Tactile contact - this category measures the amount and type of physical contact:

1. extensive physical contact - chest and pelvic regions in contact.
2. holding - arms encircled.
3. touching - hands placed on another person.
4. no contact.

Voice loudness - measures the level of a person's voice during social interaction. This was measured by ear as best as possible:

1. Very loud.
2. Loud.
3. Normal.
4. Soft.
5. Very soft.
6. Not speaking.

Overall level of intimacy - since all the microspatial scales run in the same direction, from most intimate to least, a summation of the scores for the five variables can give an index of the overall level of intimacy. The lower the total score the more sensory involvement there is in an interaction (Hall, 1974).

A number of concepts are used in the macrospatial proxemic section. They are listed here with their operational definitions.

Freedom of movement - the total number of areas or subsections of rooms entered. To qualify as an entered area, an individual must have been there for at least 5% of the location observations.

Avoided area - a room or a subsection of a room (i.e. two adjacent squares) in which an individual was not present for at least 5% of the location observations (Esser et al, 1965).

Jurisdiction - temporary defense of space, an object, or some other commodity (Roos, 1968).

Core area - the area or areas predominantly used (Kaufman, 1962). An individual must be present here for at least 25% of the location observations.

Monopolized zone - an area of exclusive use (Jewell, 19-6). An individual must be present here for at least 25% of the location observations and no other individuals may have been present for 5% of the location observations.

Relative dominance - where the outcome of a dominance interaction depends on spatial location (Leyhausen, 1971). An individual must win a significantly higher percentage of the fights that occur in his core area than he does elsewhere.

Analysis

The raw dominance data in the form of wins and losses between different individuals were used to construct dominance hierarchies (see Figures 3 and 4).

NAME	RANK	NH	MK	EC	DD	MT	JY	GG	JN	KH	DM	RI	WINS
NH	1		6	5	8	5		1	1		5	5	36
MK	2	1			3	1	4	1			1	3	14
EC	3				3	1	2			2		7	15
DD	4	2	2	1		1	2			1	2	5	16
MT	5		1		1			1		5		3	11
JY	6		1		1			1		2			5
GG	7			1								2	3
JN	8							1				1	2
KH	9					1					2	1	4
DM	10					1							1
RI	11				2				1				3
LOSSES		3	10	7	18	10	8	5	2	10	10	27	110= dominance interactions

Figure 3 - Boys Dominance Hierarchy

name	RANK	Ty	Sa	Ax	Sh	Kn	Lo	Be	Ge	Ay	Ji	Fy	Da	Bl	Hn	Sz	Gs	Rn	Dv	As	Hr	De	Ma	Dy	Wins
Ty	1		4	2		1	1			6		1						1							16
Sa	2	1				2	1				1	3	2						2	2			1	3	18
Ax	3				2	1	1			2		1									1				8
Sh	4		2			1		2	1				1	1					1		1				10
Kn	5	2	1		1								2			1					1				8
Lo	6		3		1																				4
Be	7				1								1									2			4
Ge	8									2							2								4
Ay	9				1	1		1										1						1	5
Ji	10				2				1																3
Fy	11	1	1	1																					3
Da	12					1																	2		3
Bl	13										1											1			2
Hn	14												1												1
Sz	15									1															1
Gs	16								1																1
Rn	17									1															1
Dv	18																								–
As	19																								–
Hr	20																								–
De	21																								–
Ma	22																								–
Dy	23																								–
LOSSES		4	11	3	8	7	3	3	3	12	2	5	7	1	–	1	2	2	3	2	3	3	3	4	92 Dominance interactions

FIGURE 4 - GIRLS' DOMINANCE HIERARCHY

These figures show data on wins/losses and frequency of agonistic encounters between each dyad, each cell entry refers to the number of dominance interactions that the dyad engaged in. This technique is also useful for showing the directionality and degree of onesidedness in a relationship (Altmann, 1974). If a dominance hierarchy is formed, agonistic interactions should be uni-directional; that is, the cell entries above the dividing diagonal line should exceed those below it. Two matrices were done, one for each sex.

The dominance hierarchies were further analyzed in three ways; they were tested using Guttman's coefficient of reproductibility (see Torgerson, 1958) and Menzel's (1953) coefficient of reproductibility. The third method used was to compare the percentage of dyads with established dominance (where one individual winds more than 50% of the fights between two individuals) to those without established dyads as Edelman and Omark (1973) did.

Knudson (1967, 1973) used both Guttman's and Menzel's scaling techniques in her research on bonnet macaque and preschool children's dominance hierarchies. She notes that a perfect scale would be one in which the number one ranked individual won all encounters with others, the number two individual won over everyone except number one, and so on down the list until we reach the lowest ranking individuals who never wins. Such a hierarchy rarely exists in nature, there are usually "errors" where lower ranking individuals do on occasion beat higher rankers. The following formula (see Torgerson, 1958) based on the number of "errors" or deviations from a perfect scale, was used to test the degree of rigidity of the hierarchy:

$$\text{coefficient of reproductibility} = 1 - \frac{\text{number of errors}}{\text{number of responses}}$$

This formula was carried out first of all on the data contained in Figures

3 and 4. Here, the number of errors refers to the sum of the cell entries below the diagonal line while the total number of responses equals the sum of all cell entries on either side of the line. This will be termed the coefficient of overall reproducibility. Next, the formula was applied to the data shown in the matrix of established dyads, (Figures 5 and 6), where the X's represent each individual's consolidated score; that is, the X's represent dyads where one individual won over the other more than 50% of the time. Using these data, the number of errors means the number of X's below the diagonal line while the number of responses equals the sum of all the X's and E's (where one individual did not dominate the other more than 50% of the time) on both sides of the line. This is termed the coefficient of reproductibility of established dyads.

Knudson (1967) notes that Guttman requires a coefficient of reproductibility of 0.90 for an acceptable scale, which leaves very little room for "errors". In a dynamic social system some instability is to be expected so this coefficient is too high. Further research will be needed to test this scale on animal hierarchies before an acceptable cut-off point can be established. In this thesis, this statistic will be used only loosely to determine the stability of the hierarchies.

Menzel's (1953) "coefficient of scalability" is similar to Guttman's technique so can be used as a sort of back-up test which will also guard us against the looseness of the Guttman technique. The following formula represents the coefficient of scalability:

$$\text{coefficient of scalability} = 1 - \frac{\text{number of errors}}{\text{maximum possible errors}}$$

NAME	RANK	NH	MK	EC	DD	MT	JY	GG	JN	KH	DM	RI	number dominant over
NH	1	—	X	X	X	X		X	X		X	X	8
MK	2		—		E	E	X	X			X	X	4
EC	3			—	X	X	X			X		X	5
DD	4		E		—	E	X			X	X	X	4
MT	5		E		E	—		X		X		X	3
JY	6						—	X		X			2
GG	7							—				X	2
JN	8							X	—			E	1
KH	9									—		X	2
DM	10					X					—		1
RI	11								E			—	0
number dominated by		0	1	2	2	3	3	5	1	4	4	7	32

Figure 5 - Established Dominance Dyads: Boys

name	RANK	Ty	Sa	Ax	Sh	Kn	La	Be	Ge	AY	Jt	Fy	Da	Bl	Hn	Sz	Gs	Rn	Dv	As	Hr	De	Mo	DY	Number dominant over
Ty	1		X	X			X			X		E						X							5
Sa	2					X					X	X	X						X	X			X	X	8
Ax	3				X	X	X			X		E									X				5
Sh	4		X			E		X	X				X	X					X		X				7
Kn.	5	X			E								X			X					X				4
La	6		X		X																				2
Be	7												X									X			2
Ge	8									X							X								2
AY	9				X	X		X										E						X	4
Jt	10				X				X																2
Fy	11	E		E																					–
Da	12																						X		1
Bl	13										X											X			2
Hn	14												X												1
Sz	15									X															1
Gs	16																								–
Rn	17									E															–
Dv	18																								–
As	19																								–
Hr	20																								–
De	21																								–
Mo	22																								–
Dy	23																								–
Number dominated by		1	3	1	4	3	2	2	2	4	2	1	5	1	–	1	1	1	2	1	3	2	2	2	46

FIGURE 6 - ESTABLISHED DOMINANCE DYADS: GIRLS

This formula can only be used on the established dominance data since consolidated scores are necessary in order to keep the maximum number of possible errors finite, i.e. in the overall data the number of possible errors is infinite while in the established dominance data the number of maximum errors is limited by the number of possible dyads. In the formula, number of errors equals the number of X's below the diagonal line while the maximum possible errors equals the total number of dyads which is determined by the following formula (Carpenter, 1965):

$$\text{number of dyads} = n \frac{(n - 1)}{2}$$

N here equals the total number of individuals in the group (i.e. n = 11 for boys, n = 23 for girls). Menzel offers no dividing line for when a scale is not an acceptable scale, so once again this result will be liberally interpreted.

The third analysis of the dominance data follows Edelman and Omark (1973) who compared the number of established dyads to the number of dyads without established dominance and used this to determine whether or not hierarchies are present. This is represented by the following formula:

$$\text{\% of established dyads overall} = \frac{\text{number of established dyads}}{\text{number of possible dyads}}$$

This formula will be tested on the data in Figures 5 and 6 in two ways. First, the number of established dyads (i.e. the sum of the X's), will be compared to the number of possible dyads (i.e. $n\ (\frac{n - 1}{2})$). Secondly, only those dyads who have actually fought with one another will be examined to see what percentage have established dyads. For example, in Figure 5 the number of X's will be compared to the number of dyads which fought but did not establish dominance, i.e. those designated E in the figure. This is represented by the following formula:

$$\%\text{ of established dyads which actually fought} = \frac{\text{number of established dyads}}{\text{number of X's and E's}}$$

It should be noted that the number of E's must be divided in half since they are represented in both individual's cells (i.e. the dyad MK and DD was equal so an E is put in the cell MK and DD and also in the cell DD to MK). The combined use of the coefficients of reproductibility and scalability, and the percentage of established dyads should give a good measure of the degree of stability and rigidity in the hierarchies.

In order to get an "in depth" look at the dominance hierarchy, Knudson (1973) investigated interaction rates (total amount of dominance encounters involved in), breadth of dominance (number of individuals one is dominant over), and the effectiveness of dominance (how successful one is in dominance encounters). These measures help to "flesh out" the raw dominance data and also serve to highlight the differences in dominance behavior between dominant, medium and subordinate individuals. The three measures looked at above were examined for the hierarchies discovered in the research reported here.

Also, in order to examine the dynamics of dominance behavior, background variables consisting of age, size, nursery school experience, birth order, family size, presence or absence of siblings in the group, rural/urban background, and whether parents were Newfoundlanders or Canadian mainlanders were examined to see if these factors exert any influence on dominance behavior.

Finally, the data gathered from the observability and focal individual samples were compared to the raw dominance data to determine whether or not any biases due to differential observability exist.

Three statistical tests were utilized in the analysis of the microspatial proxemic data: (1) the median test (Yeomans, 1968); (2) the chi-square test (Weinberg and Schumaker, 1969); and (3) the proportions test (Downie and Heath, 1959). The hypotheses concerning sex differences in personal distance, body orientation, tactile contact (the proxemic sample), voice loudness and total scores were compared using the statistical tests between two medians while the eye contact sex differences were analyzed using the chi-square test.

The hypotheses concerning rank differences in personal distance, body orientation, voice loudness, and total scores were analyzed using the median test while the chi-square test was used for eye contact, and the proportions test used for tactile contact.

In the case of all the variables except tactile contact, dominants were compared to subordinates while the medium rankers were used as a quasi-control group. In the cases where the scores for medium rankers were not intermediate between those of the dominants and subordinates, tests between mediums and dominants and mediums and subordinates were also done.

For tactile contact, the percentage of contacts where following the pattern dominant touches subordinate were compared to contact subordinate touches dominants using the proportions test. Only intra-sex contact was analyzed.

On the macrospatial proxemic level the t- ratio or student's t- test which measures the difference between means (Downie and Heath, 1959) was used along with the proportions test. Sex and rank differences in area entered and areas avoided were analyzed with the t- ratio test while the proportions test was used in the case of jurisdictional behavior. For relative dominance the percentage of wins within an individual's territory was compared to the percentage of wins outside the territory. Monopolized zones were not found for any individuals so no sex or rank differences were analyzed.

CHAPTER IV

RESULTS & DISCUSSION

This chapter will be divided into three sections. The first section will consist of a discussion of the findings of the dominance aspect of the study in relation to the four core structural units discussed in Chapter Two. The second section will be devoted to the results of the seventeen hypotheses tested. The third section will be an overall discussion centred on rank and sex differences in preschool children's proxemic behavior. The findings of the study will then be discussed in relation to the findings of other researchers and also in terms of the theoretical precepts of the study.

Dominance Behavior

In this section we will discuss the findings of the dominance section in relation to primate studies as well as other studies of human hierarchial systems. The findings will then be related to the four core structural units discussed earlier.

The results of the study are shown in the dominance hierarchies (Figures 3 and 4). A total of 328 dominance interactions were noted in approximately 30 hours of observation which gives a rate of about eleven dominance interactions per hour, which is quite high considering that many more probably took place outside of observation range. Of this total of 328 dominance interactions, 110 or 33.5% of the total took place between males while females accounted for 92 or 28.1% of the total. The remaining 126 dominance encounters (38.4%) took place between the sexes. Of these male-female dominance interactions the males were successful in 82 or 65.1% while the females won 44 or 34.9% of the total. However, as one may see in the effectiveness of dominance scores in Table 1 for inter-sex interactions, some of the high ranking females can hold their own with some of the males. However, in general, males are dominant over females. For example, as Table 2 shows, only two males (those ranked sixth and eleventh) had less than successful records in inter-sex dominance encounters while the majority of females had losing records.

A general glance at the dominance hierarchies (Figures 3-6) suggests that the boys were easier to rank and had more stable hierarchies. This was borne out by the statistical analysis. The coefficient of overall reproductibility was 0.85 for the boys and 0.71 for girls, which shows that the boys' dominance encounters were more uni-directional than those of the girls. The coefficient of reproductibility for established dyads (see Figures 5 and 6) also confirms this. The boys' coefficient was 0.91 while the girls' score was only 0.65.

Menzel's coefficient of scalability showed that the sexes' hierarchies were similar, both sexes had coefficients of 0.95. However, for this measure cells that are empty are counted as "positive scores" and as Figures 5 and 6 show, the females had a much greater incidence of empty cells, probably because of the greater number of individuals in their hierarchy, and this tends to inflate their coefficient score.

The percentage of established dominance dyads data gives contradictory results on the male vs female hierarchical stability question. The percentage of overall dyads with established dominance is 58% for the boys but only 18% for the

TABLE 1 - DOMINANCE DATA: BOYS

Rank	Interaction Rate			Breadth of Dominance	Effectiveness		
	M-M	M-F	Overall	M-M	M-M	M-F	Overall
1. NH	17.8%	13.5%	16.8%	8	92.3%	94.1%	92.8%
2. MK	10.9%	4.8%	9.1%	5	58.3%	66.7%	60.0%
3. EC	10.0%	13.5%	11.9%	5	68.2%	76.5%	71.8%
4. DD	15.5%	10.3%	14.3%	4	47.1%	69.2%	53.2%
5. MT	9.5%	7.1%	9.1%	3	52.4%	55.6%	53.3%
6. JY	5.9%	7.1%	6.7%	2	38.5%	44.0%	40.9%
7. GG	3.7%	14.3%	7.9%	1	37.5%	50.0%	46.2%
8. JN	1.8%	6.3%	3.7%	1	50.0%	87.5%	75.0%
9. KH	6.4%	11.1%	8.5%	2	28.6%	64.3%	48.3%
10. DM	5.0%	8.7%	6.7%	1	9.1%	63.6%	36.4%
11. RI	13.6%	11.9%	13.7%	0	10.0%	40.0%	20.0%

TABLE 2 - DOMINANCE DATA: GIRLS

		Interaction Rate			Breadth of Dominance	Effectiveness		
		F-F	F-M	Overall	F-F	F-F	F-M	Overall
1.	Ty	10.9%	11.1%	10.4%	5	80.0%	64.3%	73.5%
2.	Sa	15.8%	17.5%	15.5%	8	62.1%	63.6%	61.5%
3.	Ax	6.0%	3.2%	4.6%	5	72.7%	25.0%	60.0%
4.	Sh	9.8%	7.9%	8.5%	7	55.6%	60.0%	57.1%
5.	Kn	8.2%	10.3%	8.5%	4	53.3%	15.4%	35.8%
6.	La	3.8%	2.4%	3.0%	2	57.1%	66.6%	60.0%
7.	Be	3.8%	4.8%	3.9%	2	57.1%	33.3%	46.2%
8.	Ge	3.8%	2.4%	3.0%	2	57.1%	33.3%	50.0%
9.	Ay	9.2%	7.9%	8.2%	4	29.4%	20.0%	25.9%
10.	Jt	2.7%	1.6%	2.1%	2	60.0%	0.0%	42.9%
11.	Fy	4.3%	3.9%	3.9%	0	37.5%	40.0%	38.5%
12.	Da	5.4%	3.9%	4.6%	1	30.0%	0.0%	20.0%
13.	Dl	1.6%	1.6%	1.5%	2	66.6%	50.0%	60.0%
14.	Hn	1.1%	3.9%	1.8%	1	100.0%	0.0%	16.7%
15.	Sz	1.2%	10.3%	4.6%	1	50.0%	0.0%	7.1%
16.	Gs	1.6%	0.0%	0.9%	0	33.3%	0.0%	33.3%
17.	Rn	1.6%	2.4%	1.8%	0	33.3%	0.0%	16.7%
18.	Dv	1.6%	2.4%	1.8%	0	0.0%	33.0%	25.0%
19.	As	1.2%	3.9%	2.1%	0	0.0%	20.0%	16.7%
20.	Hr	1.6%	1.6%	1.5%	0	0.0%	100.0%	40.0%
21.	De	1.6%	0.0%	0.9%	0	0.0%	0.0%	0.0%
22.	Ma	1.6%	3.2%	2.1%	0	0.0%	0.0%	0.0%
23.	Dy	2.2%	3.2%	2.4%	0	0.0%	50.0%	33.3%

girls. However, for the percentage of established dominance in dyads which actually fought, the females had a slightly higher score - 92% - than the males who scored 87%. However, this difference is only slight.

Tables 1 - 4 show the dominance data broken down into interaction rates, breadth of dominance, and effectiveness of dominance for all individuals separately (Tables 1 - 2) and for these individuals grouped into dominance ranks (Tables 3 - 4). The interaction rate scores (total number of dominance encounters involved in) show that in both boys and girls, dominants tend to be more involved in dominance interactions than others. This holds true for girls in both inter and intra-sex dominance interactions while for the boys, dominants are more involved in intra-sex interactions but they score the same as subordinates in inter-sex interaction. With regard to boys, both mediums and subordinates engage in slightly more dominance interactions with girls than boys, while the opposite is true of the dominant boys. This suggests that perhaps lower ranking males are redirecting their agonistic behavior at girls with whom they are in a better position to be successful than if they fought higher ranking males. Looking at the girls' interaction rates, we can see that inter and intra-sex dominance interaction rates are very similar for all ranks. It is also interesting to note the rarity of the subordinate girls' participation in dominance interactions; they participated in an average of only 1.8% of the dominance encounters when by chance they would have been expected to participate in a much higher percentage of the interactions.

The breadth of dominance data (number of individuals one is dominant over) clearly show that high rankers dominate more individuals than others. This is particularly apparent in the case of the subordinate girls. Of these six girls, not one was dominant over another

TABLE 3 - AVERAGE DOMINANCE SCORES BY RANK: BOYS

RANK	Interaction Rate			Breadth of Dominance	Effectiveness		
	M-M	M-F	Overall	M-M	M-M	M-F	Overall
Dominants	13.6%	10.5%	13.0%	5.5	66.5%	76.6%	69.4%
Mediums	5.2%	8.7%	6.9%	1.8	44.6%	59.3%	53.9%
Subordinates	8.3%	10.6%	9.6%	1	15.9%	55.9%	34.9%

TABLE 4 — AVERAGE DOMINANCE SCORES BY RANK: GIRLS

Rank	Interaction Rate			Breadth of Dominance	Effectiveness		
	F-F	M-F	Overall	F-F	F-F	M-F	Overall
Dominants	9.1%	8.7%	8.4%	5.2	63.5%	49.2%	57.9%
Mediums	3.3%	3.9%	3.3%	2	50.4%	16.1%	32.5%
Subordinates	1.6%	2.4%	1.8%	0	0.0%	33.3%	19.2%

individual.

The effectiveness scores (percentage of total encounters one was successful in) for inter-sex interactions also highlight the differences between the three rank groupings and lends further support to the proposition that the groups are organized hierarchically. They also support the findings that males are generally dominant over females. All three groups of boys had winning records in inter-sex agonistic behavior while not even the dominant girls had a winning percentage.

As noted earlier, since the behavioral sampling method used was ad lib or event sampling some bias concerning differential observability by rank or sex may enter into the results. For this reason differential observability and focal individual samples were done. Tables 5 and 6 show the results of these observations. These results show tha boys were observed somewhat more than girls but it also shows that far more focal individual sampling was done on girls than boys (170 minutes for girls vs 20 for boys) which should have corrected any bias resulting from differential observability of the sexes.

Concerning differential observability of individuals, we can see that some individuals were observed less than others and this could affect their rank relative to others. In the boys' case, this could affect those ranked third and eighth, who were observed less than the other boys. While both may have moved up or down the hierarchy with more observations, it is unlikely that either would switch to a different grouping; that is, Er would not likely become a medium nor would Jn become either a dominant or subordinate. In the case of the girls, those ranked thirteenth, eighteenth and twentieth were the onse most affected. Both number thirteen and twenty attended the nursery only part time. Number thirteen was present for only 8% of the observation samples

TABLE 5 - DIFFERENTIAL OBSERVABILITY AND FOCAL INDIVIDUAL SAMPLES: BOYS

Rank		% of D.O. samples observed in	Minutes of Focal Individual Sampling
1.	Nh	50	
2.	Mk	67	
3.	Ec	33	
4.	Dd	70	
5.	Mt	67	
6.	Jy	58	
7.	Gg	75	10
8.	Jn	42	
9.	Dm	63	5
10.	Kh	67	5
11.	Ri	58	
Average		60	Total 20

TABLE 6 - DIFFERENTIAL OBSERVABILITY AND FOCAL INDIVIDUAL SAMPLING:

GIRLS

Rank		% of D.O. sample observed in	Minutes of Focal Individual Sampling
1.	Ty	46	
2.	Sa	55	
3.	Ax	25	15
4.	Sh	50	
5.	Kn	67	
6.	La	29	10
7.	Be	42	5
8.	Ge	25	15
9.	Ay	42	
10.	Jt	33	5
11.	Fy	50	15
12.	Da	79	15
13.	Bl	8	
14.	Hn	50	15
15.	Sz	58	15
16.	Gs	38	15
17.	Rn	33	
18.	Di	21	
19.	As	42	15
20.	Hr	13	5
21.	De	42	
22.	Ma	58	10
23.	Dy	42	15
Average		41	Total 170

and proved very hard to rank. My guess would be that, with more observations, she would rise in rank but probably not as high as dominant rank. The other two girls, when present, gave every indication of being subordinates so they were placed confidently in this group.

Finally, background information consisting of age, musculature (i.e. $\frac{\text{height + weight}}{2}$), nursery school experience, and so on was collected on the children from school records and questioning their parents. These data are very sketchy and unreliable since many parents had either moved away, could not be contacted, did not know the information requested, etc. Nevertheless, we will examine this data in relation to rank. The variables number of siblings, parents from Newfoundland or elsewhere, parents' background rural or urban, and birth order were not related to rank for either sex. For number of siblings, 74% of the children had one sibling, while 26% had either none or more than one. These 26% were scattered evenly throughout the hierarchy. Only 5% of the parents were from Newfoundland and/or of a rural background. Sixty percent of the children were first borns and the other 40% were distributed randomly throughout the hierarchies.

There were no rank differences in nursery school experience for girls but for boys it may be somewhat important because the lowest ranking boy had the least experience.

There were two pairs of siblings in the nursery, the brother-sister pair Jn-Dv and the sister-sister pair, Be and De, and while they did tend to spend a great deal of time together there were no apparent effects of this variable on dominance rank.

Age and musculature may be somewhat important for rank. As Table 7 shows

TABLE 7 - AGE AND MUSCULATURE IN RELATION TO RANK

RANK	AGE		MUSCULATURE	
	Boys	Girls	Boys	Girls
Dominant	47	49.5	41.3	41.5
Medium	45.3	48.3	34.7	41.9
Subordinate	43.3	46.3	38	40.5

dominant individuals tend to be older in both sexes, although the differences are only in the range of 3-4 months. In the boys' case, dominants tend to be slightly larger than others, while for girls there are no real differences.

Knudson (1973) in her study of preschool children's dominance hierarchies, found that age and musculature were significantly related to rank for girls but not for boys. McGrew (1972) also found these variables to be important for boys. Both Knudson and McGrew also found that nursery school experience was related to rank. A qualitative observation made in this study supports their latter finding. A number of children in the group described in this thesis were members of another group on which I did a pilot study about a year earlier. In the observations done on the pilot study group, it was found that the alpha male in the group described here was a very low ranking individual. So, in the course of a year he moved from the bottom of one group's hierarchy to the top of his next year's group.

In Chapter Two, after a review of primate ranking systems four core structural units of rank orders were identified. They are: (1) males are generally dominant over females and are more involved in dominance interactions; (2) males are easier to rank than females and have more stable hierarchies; (3) each sex has a separate hierarchy; and (4) dominance relations are learned in early peer behavior. This fourth principle was used more as an assumption than as a principle to be empirically examined, so the data reported here have no real bearing on it. However, we can examine the other three principles to see if they apply to preschool children's hierarchies as Knudson (1973), Edelman and Omark (1973) and others have found.

The first principle concerning male dominance was confirmed in this study. As we noted, males won 65% of the dominance interactions that took place between the sexes while they lost only 35%. Males were also involved in more dominance interactions than females. Male-male interactions comprised 33.5% of the total, while female-female encounters accounted for 28.1%. This difference becomes more significant when it is recalled that males comprised only 32.4% of the group and females 67.6%. Because there were more females they should have been involved in more dominance interactions, but the opposite was true.

The second principle that males are easier to rank and had more stable hierarchies was also confirmed. The boys were easier to rank probably because they engaged in more dominance interactions, i.e. the boys averaged ten dominance interactions each while the girls' average was only four. There were also a large number of girls who rarely engaged in dominance behaviors; this was not true of the boys. The boys' hierarchy was also more stable. Of the five statistical tests, the boys' hierarchy was shown to be more stable in three tests (coefficient of overall reproductibility, coefficient of reproductibility for established dominance, and percentage of dyads with established dominance overall), the sexes were equal on one test (coefficient of scalability), and the girls scored higher on one (percentage of established dominance in dyads which fought), although the difference here was slight.

The boys' hierarchy may have been more stable because it involved fewer individuals. The boys' hierarchy contained eleven individuals whereas the girls' was composed of twenty three, it is obvious that it would be easier to rank oneself in relation to ten others than to twenty two others. Also, while boys were easier to rank, the dividing of the hierarchy into high, medium and low was easier to do for girls than boys. In the girls' hierarchy, as Figure 4 shows, the top six girls were clearly dominant (although there was a lot of jockeying for positions within this category), the bottom six girls were very subordinate, while the other eleven were of medium rank. In the boys' case (see Figure 3) there was an undisputed alpha male and three clear subordinates, but the other divisions were hard to make. Nevertheless, the hierarchy could be divided along high, medium and low gradients, although not as easily as could the girls.

The third principle, that each sex would have a separate hierarchy, was only partially confirmed. While, as we have seen, each sex does have a separate hierarchy, there were more between-sex agonistic encounters than expected. There were 126 such interactions, 38.4% of the total amount, which is more than for male-male or female-female interaction, which suggests that there may be an overall group hierarchy as well. However, because of the large number of individuals involved (34) and also because there were not enough dominance interactions for many children, an overall hierarchy was not constructed. If an overall hierarchy was constructed, it would generally follow this pattern; dominant and medium males on top, dominant females and subordinate males in the middle, and medium and subordinate females on the bottom.

To summarize, we have seen that the preschool children's group described here has a relatively well-defined and stable ranking system which shares many common features with primate rank orders. For example, males are more involved in dominance, are easier to rank, have more stable hierarchies, and are generally dominant over females. However, dominance hierarchies are not synonymous with social organization, they form only one aspect of group structure, and they are useful only in so much as they function as intervening variables which can predict other social behaviors (Richards, 1974). The following two sections assess the degree to which dominance rank, along with sex, influences preschool children's spatial behavior.

Hypotheses Tested - Results

(1) Dominants would use less personal space than subordinates.

This hypothesis was not confirmed. As Table 8 shows, the differences between the median scores of high, medium, and low ranking children did not differ enough to be statistically significant.

TABLE 8 - RANK DIFFERENCE IN MICROSPATIAL PROXEMIC BEHAVIOR

(MEDIAN SCORES)

Rank	Personal Distance		Body Orientation		Voice Loudness		Total Scores	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Dominants	8.40	5.45	3.02	3.39	5.75	5.72	20.81	19.98
Mediums	8.61	6.55	2.74	4.35	5.88	5.88	21.62	21.11
Subordinates	8.55	7.44	3.05	4.51	5.91	5.92	21.20	21.23
	NS	NS	*	NS	*	*	NS	NS

* $p < .001$

(2) Females would use less personal distance than males.

This hypothesis was not confirmed. As Table 9 shows, differences between the median scores of the boys and the girls did not reach statistical significance.

(3) Dominants will have a more direct body orientation than subordinates.

This hypothesis was not confirmed for either sex, as Table 8 shows. However, for the boys there were significant rank differences with medium rankers using a more direct body orientation than dominants and subordinates. For the girls the median scores were not significantly different.

(4) Males would use a more direct body orientation than girls.

This hypotheses was confirmed (Table 9). Males did use a more direct body orientation than females in same-sexed peer interactions. This relationship was tested using the median test (Yeomans, 1968) and the results showed that the difference was significant ($p < .01$).

(5) Dominants would engage in more eye contact than subordinates.

This hypothesis was confirmed for girls but not for boys (see Table 10). In the girls' case, this relationship was tested using the chi-square test which showed that dominants differed significantly from subordinates ($p. < .001$), and mediums ($p < .02$). For the boys the differences were not significant between the different classes.

Dominant girls were also the receivers of more eye contact than subordinates ($p. < .01$) or mediums ($p < .05$) while in the boys' case there were no

TABLE 9 - SEX DIFFERENCES IN MICROSPATIAL PROXEMIC DATA (MEDIAN SCORES)

Sex	Personal Distance	Body Orientation	Eye Contact	Tactile Contact	Voice Loudness	Total Scores
Boys (n = 520)	8.56	2.93	1.86	3.95	5.85	21.19
Girls (n = 492)	5.75	4.27	1.92	3.95	5.84	20.58
	NS	*	*	NS	NS	NS

* $p < .01$

TABLE 10 – RANK DIFFERENCES IN EYE CONTACT

Rank	Initiators				Recipients			
	Boys		Girls		Boys		Girls	
	Look At	Look Away	Look At	Look Away	Look At	Look Away	Look At	Look Away
Dominants	41	139	41	148	39	128	36	146
Mediums	31	122	21	156	36	128	23	168
Subordinates	40	147	7	119	37	152	10	109
	NS		*		NS		*	

* $p < .05$

significant differences between the rank classes in eye contact received.

(6) Females would engage in more eye contact than males.

As Table 9 shows, this hypothesis was not confirmed. In fact, males used significantly more eye contact than females. This was tested by both the median test and the chi-square test and in both cases males were found to engage in significantly more eye contact ($p < .01$).

(7) Dominants would touch more and be touched less.

This hypothesis was partially confirmed (see Table 11). This relationship was tested using the proportions test. For the males, a significant relationship was found for the ad lib sample ($p < .05$) but not for the proxemic sample. When the data from the proxemic sample and ad lib sample were combined, the relationship was significant ($p < .01$).

TABLE 11 - RANK DIFFERENCES IN TACTILE CONTACT

Pattern	Proxemic Sample		Ad Lib Sample		Combined Sample	
	Boys	Girls	Boys	Girls	Boys	Girls
Dom — Sub	22(62.9%)	16(50%)	35(70%)	57(62.6%)	57(67.1%)	73(59.3%)
Sub — Dom	13(37.1%)	16(50%)	15(30%)	34(37.4%)	28(32.9%)	50(40.7%)
	NS	NS	*	*	**	NS

* $p < .05$

** $p < .01$

In the girls' case, the relationship was not significant for the proxemic sample or the combined sample while in the ad lib sample the relationship was significant ($p < .05$).

(8) Females would engage in more tactile contact than males.

This hypothesis was not confirmed (see Table 9). The data from the proxemic sample only were statistically analyzed and the difference was not significant. The proxemic sample only was used in this case because it is less subject to observer bias than is the ad lib sample.

(9) Dominants would use a louder voice than subordinates.

This hypothesis was confirmed for both sexes (see Table 8). This relationship was tested using the median test and results showed that for boys, dominants talked louder than subordinates ($p < .01$) and medium rankers ($p < .001$). In the girls' case, dominants talked louder than both subordinates ($p < .001$) and mediums ($p < .001$) also.

(10) Boys would use a louder voice than girls.

This hypothesis was not confirmed (Table 9). Both sexes were almost identical in voice loudness.

(11) Dominants would be more intimate than subordinates.

This hypothesis was not confirmed. As Table 8 shows the rank differences were quite small and not statistically different.

(12) Girls would be more intimate than boys.

This hypothesis was not confirmed. As Table 9 shows the differences between the boys and girls were far too small to be significant.

(13) Dominants would enter more areas and avoid less than subordinates.

This hypothesis was not confirmed for boys and only partially so for girls (see Table 12). For girls there were rank differences in areas avoided with subordinates avoiding more areas than dominants ($p < .05$). This was tested using the t-ratio or test of significance between means.

TABLE 12 – RANK DIFFERENCES IN MACROSPATIAL PROXEMIC BEHAVIOR

Rank	Areas Entered (means)		Areas Avoided (means)		Jurisdiction	
	Boys	Girls	Boys	Girls	Boys	Girls
Dominants	8.67	9.67	1.70	2.67	16(43.2%)	25(89.3%)
Mediums	8.67	8.67	3.39	6.00	5(13.5%)	3(10.7%)
Subordinates	7.33	6.67	1.41	6.67	16(43.2%)	0 (0%)
	NS	NS	NS	*	NS	**

* $p < .05$

** $p < .01$

(14) Boys would enter more areas than girls.

This hypothesis was not confirmed (see Table 13). In fact, the two sexed were almost identical on this measure.

(15) Dominants would be more likely to occupy monopolized zones and show jurisdictional behavior than subordinates.

This hypothesis was not confirmed for boys but was partially confirmed for

TABLE 13 - SEX DIFFERENCES IN MACROSPATIAL PROXEMIC BEHAVIOR

Sex	Areas Entered (means)	Areas Avoided (means)	Jurisdictional
Boys	8.22	3.00	37 (56.9%)
Girls	8.33	5.11	28 (43%)
	NS	NS	NS

NS = no significant difference

girls (see Table 12). No individuals of either sex occupied monopolized zones but there was a very strong relationship between dominance and jurisdiction in girls. This was tested using the proportions test and the results showed that dominant girls were more jurisdictional than both subordinates ($p < .001$) and medium rankers ($p < .05$).

(16) Boys will be more likely to show jurisdictional behavior than girls.

This hypothesis was not confirmed. Table 13 shows the differences between the sexes were not large enough to be significant.

(17) If relative dominance is shown it will be characteristic of subordinates.

This hypothesis was not confirmed. As Table 14 shows, only one individual (i.e. DD) showed relative dominance and this was a high ranking boy.

TABLE 14 — RELATIVE DOMINANCE

	Within Core Area			Outside Core Area		
Rank	Wins	Losses	% Wins	Wins	Losses	% Wins
1. NH	7	0	100.0	44	4	91.7
2. EC	5	2	71.4	23	8	74.2
3. DD	5	1	83.3	20	21	48.8
4. MT	1	2	33.3	15	13	53.6
5. GG	0	2	0.0	12	12	50.0
6. JN	2	0	100.0	7	3	70.0
7. KH	2	5	28.6	12	10	54.5
8. DM	2	5	28.6	6	9	40.0
9. RI	1	10	9.1	8	27	22.9
Total	25	27	48.1	147	107	57.9
1. TY	2	1	66.6	23	8	74.2
2. SA	2	2	50.0	30	17	63.8
3. AX	0	1	0.0	9	5	64.3
4. JT	1	0	100.0	2	4	33.3
5. FY	0	0	0.0	5	8	38.5
6. DA	0	1	0.0	3	11	23.1
7. AS	0	1	0.0	1	5	16.7
8. MA	0	0	0.0	0	7	0.0
9. DY	0	1	0.0	2	6	25.0
Total	5	7	41.7	75	71	51.4

DISCUSSION

Microspatial Proxemic Behavior

The main question to be addressed in this section is: To what extent are the relationship variables, dominance rank and sex, useful as intervening variables for preschool children? More specifically, to what extent do dominance rank and sex allow one to predict the proxemic behavior of preschoolers? The extent to which these variables are involved in proxemic behavior will also aid us in evaluating Baldwin and Baldwin's (1974) social learning theory of spacing and Mehrabian's (1971) power metaphor.

The effects of rank and sex on microspatial proxemic behavior will be discussed first, followed by a discussion of macrospatial behavior. Finally, an overall discussion of the usefulness of these two variables in predicting proxemic behavior will be presented.

On the microspatial level, there were significant rank differences in tactile contact and voice loudness for both sexes, while there were rank differences for body on body orientation (but mediums, not dominants, were most direct), and for girls on eye contact. Dominants in general are more direct and involved in their proxemic behavior than others. They only variable on which there were no rank differences was personal distance. Thus, we can see that dominance rank is a fairly good predictor of microspatial proxemic behavior for both sexes, although there are some sex differences in the variables with which dominance rank is involved.

As noted, no significant rank differences were reported for personal space. However, Hudson et al (1972) and King (1966) did find that measures similar to dominance were important factors in determining children's personal space, which suggests that further research might validate this relationship.

Concerning body orientation, we saw that dominance rank exerts an important influence in many nonhuman animals. Hall (1963) argues that rank also exerts an important influence on directness of body orientation in humans. Very little empirical work has explored this relationship and our results do little to clarify it. For boys it turned out that mediums, and non dominants as hypothesized, were more direct. The girls' data, which showed no significant differences, also offers little empirical support to Hall's hypothesis. Clearly, much more research is needed.

Data from studies on nonhuman animals and human adults suggest that eye contact is sued to communicate dominance. Dominance and eye contact were significantly related in girls and the rank differences approached significance in boys, which suggests that dominance in preschool children is also communicated by eye contact.

It was also found that in the case of the girls, dominants were looked at by others more than were lower rankers. This finding supports Chance's (1967) conception of attention structure, which holds that subordinates should spend more time monitoring dominants than *vice versa*, Hudson *et al* (1972) and Omark (1972) also found the attention structure model useful for describing young children's behavior. This finding that lower ranked girls watch dominants more also fits Edelman and Omark's (1973) thesis that girls' participation in dominance is of an observatory nature, while boys are participatory. That is, boys obtain information on relative ranking by fighting while girls learn the rank order by watching and observing others' behavior.

Numerous nonhuman primate studies have found rank differences in tactile contact but little research has explored this relationship on the human level. Our results showing that dominants touched more and were touched less, which were found to be significant for the ad lib and combined samples for boys and on the ad lib sample for girls support the hypothesis that this relationship between rank and contact operates on the human level as well, at least for preschool children.

Almost no research has been done on rank differences in voice loudness but our data which shows that dominants of both sexes use louder voices, is in accordance with the few studies done on adults (i.e. Mehrabian, 1971; Argyle *et al*, 1970). It appears that a loud voice, like eye contact and tactile contact, may be used to communicate dominance in preschoolers.

Moving to sex differences, significant differences were found on the micro-spatial level for the variables eye contact and body orientation. There was very little difference for tactile contact or voice loudness but males did use a more direct body orientation and more eye contact when interacting with same-sexed peers than did the females. Thus, it is apparent that sex, like dominance rank, also exerts an important influence on the microspatial behavior of young children.

Females tend to use less space in both nonhuman primates and human adults but very mixed results have been found in studies of young children. Some have found that females do use less space (Omark, 1972), while Beach and Sokoloff (1974) found that females used more space than males, while still others report no sex differences (McGrew and McGrew, 1972; Eberts and Lepper, 1975). Our results do little to clarify this confusion. More research on the developmental aspects of personal distance are needed before any firm answers can be given to the question of sex differences.

Mixed results are also the rule for sex differences in body orientation. Females are usually more direct in adults and older children (Jones, 1971; Aiello and Cooper, 1972), but in younger children males are more direct (Aiello and Aiello, 1974; Aiello and Jones), which is in accordance with our results. However, Jones and Aiello (1973) found young males to be less direct, while Beach and Sololoff (1974) found no sex differences, although their measure was very simplistic (i.e. either direct or not direct). Again, more studies are needed to clarify this issue.

One reason why young males may use a more direct body orientation than females could perhaps be that body orientation is connected with dominance. Since dominance is more of an issue in boys' groups than girls' (Maccoby and Jacklin, 1974), they would be expected to use a more direct body orientation.

However, this contention is weakened by the fact that body orientation was not related to high rank for either boys or girls in this study.

Males were also found to use more eye contact than females. This is in opposition to numerous studies on nonhuman primates, human adults, as well as young children (i.e. Russo, 1975) which have found that females engage in more eye contact. The only other study, besides this one, on preschoolers found no sex differences in eye contact (Beach and Sokoloff, 1974). It was found that eye contact could be used to communicate dominance in this study so since, as we suggested earlier, boys are more involved in dominance, they would be expected to engage in more eye contact. By adulthood, dominance may be less important in social interaction so other functions of eye contact may take over, leading females to use more eye contact. More research is needed to determine what eye contact "means" to preschool children.

Girls were expected to engage in more tactile contact but no sex differences were found. This could be due to the fact that all types of physical contact, including agonistic contact, were scored as contact in this study. A more likely measure on which sex differences would occur would be on a more restricted measure consisting of positive, non-agonistic tactile contact.

Very little research has been done on sex differences in voice loudness and no sex differences were found here. This variable is very hard to measure by ear and is more amenable to laboratory studies where more rigorous measures would be better able to concretely identify any sex differences that may be present in this variable.

Generally, the results of this study, along with others, shows that sex is an important determinant of preschool children's microspatial proxemic behavior. Aiello and Aiello's (1974) prediction, based on studies of older children, that sex differences would be of only minimal importance for preschoolers is not supported by the available empirical data. Sex differences were found in body orientation and eye contact in this study and other researchers have found sex differences in personal distance and tactile contact which support the argument that sex is an important determinant of perschool children's proxemics. However, the directionality of many of these sex differences are unclear at the moment.

Macrospatial Proxemic Behavior

Moving to the macrospatial proxemic level, dominance rank was related to jurisdictional behavior and areas avoided for girls while it was not significantly related to any of the matrospatial measures for boys.

The concepts of monopolized zones and relative dominance did not prove to be useful in this group of children. No monopolized zones were found and only one individual showed relative dominance which suggests that these concepts are not applicable to preschool children. However, others (i.e. Esser, 1970) have profitably utilized these variables in studying humans so their applicability to preschool children should be investigated in further studies done in different physical environments.

Areas entered or freedom of movement was not significantly related to rank in either sex. Thus it appears that the principle of differential mobility according to rank is not prevalent in this group of preschoolers.

Areas avoided was significantly related to rank for girls but not for boys.

For the girls, dominants avoided significantly fewer areas than lower-ranking individuals. Previously, this relationship had been reported only for adult male mental patients (Esser et al, 1965) but our results suggest that it applies to preschoolers as well, at least to females. Since subordinates avoid more areas, they are more limited in what the nursery can offer them while the higher rankers are more free to participate in many varied experiences.

Jurisdictional behavior was also significantly related to rank for girls, but not for boys. This relationship was very significant for girls, although dominants made up only 25% of the group they accounted for 89.3% of the jurisdictional behavior, while the subordinates showed no jurisdictional behavior whatsoever.

The effects of the physical environment on behavior is clearly shown in the case of jurisdictional behavior. In a pilot study on children in another school, very little jurisdictional behavior was shown while in this study the behavior was not uncommon (over 2.2 occurrences per hour of observation). It appears that this difference was partly due to the physical structure of the nursery school. In this study, 69% of the jurisdictional behavior took place in three areas; squares number 14 (26%), 15 (23%), and square number 13 (20%). All three of these areas; a partitioned-off play kitchen, a walled-in storage room, and a gymnastic apparatus, were easily defensible because of barriers, doors, etc. In areas which were less defensible, jurisdiction was rare. One reason why there may have been little jurisdictional behavior in the pilot study is that the children had few defensible areas.

As we have seen in the review of the literature, there have been ambiguous findings concerning the relationship between dominance and territoriality or jurisdiction. The problem also showed up on our results, which found that dominance was related to jurisdiction for girls but not for boys. Edney (1975) has recently proposed that the broader concept of "control" be substituted for dominance. This concept, which refers to the general influence one person has over another has the advantage of making the concept broader by making it applicable to cognitive ideas as well as social behavior but it needs a more refined operational definition and has empirical validation.

Sex was a very poor predictor of the macrospatial behavior. No significant sex differences were found on any of the measures which could be due to the small sample size; more data, I believe, would have statistically confirmed that boys were more jurisdictional. This assumption is based on the observations of others (i.e. Knudson, 1973) and the small smaple size problem. However, empirical data are necessary to validate this.

Omark (1972) and Harper and Sanders (1974) both found that boys need more space in play than girls. However, this was not found in this study. Both Omark's and Harper and Sanders' observations were made on outdoor behavior so the physical environment of the nursery school may cause the males to tone down their gross motor activity.

Predicting Proxemic Behavior

By way of summary then, it can be said that sex and dominance rank are fairly useful predictors of preschool children's proxemic behavior, and as such are useful as intervening variables. This is especially important in the case of dominance since, as we saw earlier, some researchers (Blurton Junes, 1967;

and Edelman and Omark, 1972) have argued that dominance is not a useful concept for describing or explaining preschool children's behavior. The results of this study, by showing that dominance rank was an important determinant of preschool children's proxemic behavior, erodes confidence in Blurton Jones' and Edelman and Omark's assertion. Further studies are needed to determine what other social behaviors are influenced by dominance. The results of this research also lend some empirical support to Baldwin and Baldwin's (1974) social learning theory of spacing and Mehrabian's (1971) power metaphor.

Both sex and rank were better predictors of microspatial than macrospatial proxemic behavior. For both sexes there were rank differences of three of the five microspatial proxemic variables while there were sex differences on two of the variables. On the macrospatial level there were rank differences on two variables for girls but none for boys. There were also no significant sex differences on any of the macrospatial measures.

Rank was a somewhat better predictor of the girls' spatial behavior than the boys'. On the microspatial level there were no differences but on the macrospatial level there were more rank differences for girls than boys. This is surprising because, since dominance is more an issue in boys' groups, it would be expected to predict their behavior better. On the other hand, Strawbridge (1974), drawing from Bardwick's (1971) research which suggests that relationship variables exert more influence on girls' behavior than boys', argues that relationship variables may also be more important determinants of girls' proxemic behavior than of boys' behavior. Some empirical data to support this proposition are available (i.e. Hashka and Nelson, 1972). This would make an interesting and important topic for further research.

In concluding this section, it is necessary to point out that proxemic research is still in the early formative stage and much more empirical data are needed both on different animal species and different populations of humans before any firm explanations of these behaviors can be offered. It is hoped that this thesis may be a contribution to this data bank.

CHAPTER V

SUMMARY AND CONCLUSIONS

The main purpose of the study was to investigate the effects of two relationship factors, dominance rank and sex, on preschool children's proxemic behavior on both the micro and macrospatial behavioral levels. The goal of the research was to demonstrate that these two variables, contrary to the expectations of some researchers, are useful as intervening variables and as such could help one to predict preschoolers' spatial behavior. A secondary, and more general goal, was to show that studies done on other animal species, especially nonhuman primates, can be used profitably as a guide to deriving and testing hypotheses on human behavior.

To these ends a number of hypotheses were generated from reviewing studies of animal and human adult proxemic behavior, as well as from a few general theoretical precepts. These were tested on a group of preschool children attending a day care centre in St. John's. An eight week field study was conducted on the children, using naturalistic methods of observation.

It was found that the preschool children had a relatively well defined and stable dominance hierarchy which shared many features with nonhuman primate ranking systems. Three hierarchies were present, each sex had it's own hierarchy and there was some evidence that the group as a whole was loosely organized hierarchially. A number of sex differences in dominance behavior were noted. Boys were generally dominant over girls, they engaged in more dominance interactions, were easier to rank and had better defined and more stable hierarchies than did the girls. Dominant individuals of both sexes were more involved in dominance interactions, dominated more individuals, and were more successful in their dominance behavior than were lower-ranking individuals. Dominance was related to age for both boys and girls, and to size and nursery school experience for the boys only. Other variables such as birth order, number of siblings, and parents' backgrounds were not related to rank for either sex.

As hypothesized, dominance rank and sex did prove to be useful as intervening variables in the prediction of proxemic behavior, although they were much more useful in predicting microspatial behavior than macrospatial proxemics. Rank differences were found in voice loudness and tactile contact for both sexes while eye contact was significantly related to rank for girls only and body orientation to rank for boys only. Personal distance was the only microspatial variable for which no rank differences for either sex were found. Sex differences were found in body orientation and eye contact, with males being more direct in each case. There were no differences for tactile contact or voice loudness.

On the macrospatial level rank was significantly related to jurisdictional behavior and areas avoided for girls, while there were no rank differences on any of the variables for boys. No sex differences were found for any of the macrospatial variables.

The results allow the following two conclusions to be made: (1) that dominance and sex are useful as intervening variables in the study of preschool children's proxemic behavior especially on the microspatial proxemic level. This finding also shows that the concept of dominance is a useful concept which can be profitably used in the study of preschool children's social behavior, which some researchers have doubted; (2) that animal behavioral research is useful for deriving hypotheses which can be tested on human behavior. This reservoir of data offers numerous concepts and research leads to proxemicists for use on the human level. A truly cross-specific, evolutionary orientation to proxemic research might also integrate the discipline of proxemics and add to the field's lack of theory.

Since dominance rank successfully predicted many aspects of the children's proxemic behavior it would be interesting to use the concept in studying other aspects of children's social behavior to assess its range of influence. This study could also be replicated on other populations such as different age groups, different cultures, or different species. In the future I hope to replicate this study either on a group of nonhuman primates or on a non-Westernized cultural group.

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