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ASSOCIATED WITH CERTAIN PHYSICAL AGGRESSIVE  
CONTACTS OF YOUNG CHILDREN IN GROUP SETTINGS.

University of North Carolina at Greensboro,  
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VARIATIONS IN AMOUNT OF INDOOR PLAY SPACE  
AS ASSOCIATED WITH CERTAIN PHYSICAL  
AGGRESSIVE CONTACTS OF YOUNG  
CHILDREN IN GROUP SETTINGS

by

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The purposes of this study were twofold: (1) to inquire into the origin and significance of historically recommended amounts of indoor space needed for young children in group settings; and (2) to conduct an experiment which would search for the effects of variations in amounts of indoor space on the frequency of physical aggressions among young children in group settings. For this experimental study a null hypothesis was proposed: There will be no differences in the incidence of anti-social physical aggressive contacts in varying amounts of space.

The experimental study was conducted in two United Day Care centers in Greensboro, North Carolina. Thirty Negro children from the younger groups in each center, ranging in age from 2 years 5 months to 4 years 11 months were the subjects of a total of one hundred forty-four 5-minute units of observations. In each center, for a period of two weeks, three days per week, the amount of floor space for a randomly selected group of seven children was controlled by the use of movable wooden lockers. "Rooms" of specified area (50 square feet, 20 square feet, and 35 square feet per child) were arranged twice each morning of the experiment-- before the children arrived for free play, and in the interval when children toileted before mid-morning snack and a grouptime activity. Such "room" arrangement was achieved

through the use of portable wooden lockers used for children's personal belongings. Two observers, using a specially designed measures card, tallied physical aggressions as they saw them occurring during the observational periods designated as "Free Play" and "Grouptime."

The design was a randomized complete blocks design. There were four blocks--two weeks in each of two day care centers. Each block contained three days which were assigned to ordered pairs of three possible space conditions. An analysis of variance was used to search for a possible relationship between variations in amount of play space and the frequency of anti-social physical aggression.

In the review of literature the investigator found no systematic research in which amount of indoor space was used as a variable. Two studies (Jersild and Markey, 1935; Murphy, 1937) after data were analyzed, acknowledged a possible relationship of space to anti-social aggression.

The literature did point, however, to the fact that 35 square feet per child (excluding space for toilets, kitchen, storage, etc.) was most often recommended or required as a minimum space allowance in programs for young children. Apart from "considered judgment" of experts and practitioners, the most convincing and systematic argument for 35 square feet per child was the need to meet public health standards for the proper spacing of children's rest mats and/or sleep cots in day care centers.

The analysis of data in the present study revealed

evidence of an increase in aggressive acts as space for free play was reduced from 50 to 35 to 20 square feet per child. The average change was about one aggressive act for each reduction of 15 square feet, the actual estimate being  $.85 \pm .38$ . In the group time periods no effects of space conditions were detected.

The effects of varying the design and of increasing the size of the experiment were calculated. It was pointed out that fair precision would be achieved if a future design required three 3-day weeks at each of six day care centers, noting, however, that the present investigation achieved a coefficient of variation of 44% with 4 days at each of the 3 space conditions.

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## CHAPTER I

## INTRODUCTION

Today's world is becoming increasingly familiar with the term "space" and with other sometimes related words: "crowding," "population explosion," and "togetherness." Such descriptive terms seem equally appropriate in real estate advertising, in propaganda statements for school bond issues, or in scientific journals concerned with housing the inhabitants of the next century. A popular magazine, American Home (Curtis Publishing Co., 1967, p. 51) announced in its lead article: "This special issue is devoted to the most pressing problem of our time--finding enough space for the good life." In similar vein, CBS television, "Evening News" offered philosophical inquiry:

We are 200 million, but some thoughtful men suggest that it is not necessarily anything to be proud of, since so many of the 200 million already live lives that are not good or true or beautiful, since our children will live to see the day when there are 600 million Americans, and their children may live in an America of a billion and a half. The standing room only day is not very far ahead. Some people are asking questions about this. Don't the best qualities of men atrophy when they are jammed too closely together? Don't the laws of nature still obtain, the ones that hold that there is a maximum population for every species? (CBS News).

A social scientist (Hall, 1966) contended that Man's ethnic and cultural background accounts for response to space

conditions. Calhoun (1962) described the astonishing behavior of rats subjected to population density; they tend to feed where the "crowd" is. Medical teams have examined the psychological aspects of "enclosure" in Antarctic living and have speculated that such lack of space in that environment may be a factor in trends toward insomnia, irritability, and mild depression (Nelson, 1964). In contrast, the National Aeronautics and Space Administration included in its voluminous reports studies of stresses produced by the small size of work space, and concluded that "no phenomena were encountered that would preclude the use of a small capsule and a 7-day mission" (Rathert, n.d., p. 1).

In planning group settings for young children the factor of space has long received attention. A pioneer of nursery school education in England (McMillan, 1921) wrote of the value of space:

Within the shelter only space is wanted, space for little feet that run the whole length of the room and back again as a new and glad experience. Space to trundle hoops, to play at ball with little hands outstretched and missing always, but always eager! (p. 37).

A few pages later this author writes more specifically: "A room of forty feet by thirty feet wide is not too large for a family of forty children (p. 41)."

Fifty years later, in present-day programs for young children, "space" is still "wanted." Where accreditation or licensing is sought, minimum space requirements are

considered an essential factor in qualifying for recognition. In Schools for Young Children (North Carolina. Office of the Superintendent of Public Instruction, 1955, p. 19) the directive reads:

Space enough for good school living indoors varies in relation to many factors in each situation.

Experience and research in this area suggest that the minimum should be:

Per nursery school child. . . . .35-50 square feet  
Per kindergarten child. . . . .40 square feet.

The most recent recommendations for kindergartens from the Governor's Study Commission on the Public School Systems in North Carolina (North Carolina. 1968, p. 57) advise 60 square feet for each child.

The Child Welfare League of America (1960, p. 47) requires for day care centers: "Under no circumstances should the amount of playroom space per child be under 35 square feet." This follows in a paragraph which begins: "A ratio of fifty square feet of playroom space per child is optimum, and in addition there should be space for other purposes such as bathroom, and cooking facilities, stairs, halls or offices."

Headstart, early childhood education's newest venture in the United States, expects amount of space to be that required by the state agency charged with licensing day care centers.

Perhaps one of the reasons for this traditional point of view about space needs is that nursery school educators

hypothesize a rather direct relationship between the amount of "place-to-be" a child has and the amount of physical and verbal aggression he displays. A few studies involving pre-school children have suggested a relationship between amount of space and the incidence of aggressive behavior in nursery schools (Green, 1933; Jersild and Markey, 1935; Murphy, 1937).

In our American middle-class culture, verbal and physical attack are considered inappropriate and detrimental to the well-being of all persons. Listing "friendliness" as a significant American characteristic, authors Martin and Stendler (1953, p. 272) wrote: "It is this emphasis upon friendliness that makes overt aggression intolerable." When teachers in programs for young children consider these ideas, the reasoning in favor of adequate space suggests: Increase the possibility for spatial "distance" among children in the early years when tolerance to stress is low so that they may have less stimulus for physical conflict and more opportunity to be successful in positive social relationships.

In large part, these points of view have come from experiences with children in half-day, small group, laboratory-oriented programs for young children. In the past decade, however, the fact of increasing numbers of working mothers and their needs for all day care for their children has added an emergency dimension to any

consideration of space needs for children in group settings. What shall be said now about space proportions when nationally there are only one-half million places in licensed day care for 11,000,000 children under 12 years of age? (Day Care and Child Development Council of America, Inc., 1968).

This investigator affirms the importance of space to children's group living. However, certain questions may be raised to which answers appear not to be substantiated by research:

1. What is the origin of the usually recommended 35 to 50 square feet of indoor play space for each child?
2. Is amount of indoor play space related to the incidence of aggressive behavior?
3. Could other factors such as class size, ratio of adults to children, arrangement of room, programmed training in social give-and-take, the presence of one or more very aggressive children who provide the model for others--or a combination of these factors--be the important variables in relation to aggressive behavior in a group setting?
4. Do children from different cultural backgrounds require or prefer varying amounts of play space?
5. Is spatial privacy an ingredient necessary for health, or is this model an Americanized ideal? What is a realistic approach to the use of personal space for a generation which struggles with the world problem of "population



explosion"?

Because of her personal interest in the question of space requirements, and because professional leaders and lay people concerned about the well-being of young children in group programs need facts from research efforts, this investigator has attempted to answer questions one and two. She searched the literature extensively and engaged in wide correspondence in an effort to answer the first question: What is the origin of the usually recommended 35 to 50 square feet of indoor play space per child? She set up an experimental study as a means of answering the second question: Is amount of indoor play space related to the incidence of aggressive behavior?

There were three purposes for this experimental study:

1. To search for indications of the effect of space on young children's anti-social aggressive contacts.

2. To develop a technique and an instrument for detecting differences in frequency of anti-social physical aggression as they may be affected by space conditions in the normal functioning of a group setting.

3. To estimate the amount of observation required to detect such differences with varying degrees of precision.

A null hypothesis was proposed: There will be no differences in the incidence of anti-social physical aggressive contacts of children in varying amounts of space.

## CHAPTER II

## REVIEW OF LITERATURE

Recommendations Regarding Space Requirements

There is an abundance of educational, philosophical, and social welfare commentary about provisions for space in group programs for young children. Descriptions of the kind and amount of space needed, however, are varied and often vague. They range from "plenty" (Neterer, p. 1; Dittmann, p. 76) through "ample" (Fuller, p. 154) and "generous" (Haskell, p. 88) to "spacious" (Forest, p. 139; Nichols, p. 186).

Some have written of space in poetic fashion as indicated in a reference (McMillan, 1921) in the preceding chapter. Another Englishwoman (Johnson, 1928) first to establish a nursery school in the United States, is even more eloquent:

Out of doors and in, we have in the first place, space. . . . Have you thought what it would be like suddenly to acquire levitation: to find that you could propel yourself through space, not soaring perhaps but just freely floating without the contact of feet against pavements and without the slow pace consequent upon that method? . . . I believe the acquisition of locomotion brings a comparable experience into the life of a child (pp. 67-68).

In those early days, some leaders concerned about young children in groups recognized the apparent need for

space by referring to "crowding" or by requiring a certain number of rooms in a day nursery. Tyson (1923) described the physical settings among 61 day nurseries in Pennsylvania:

The equipment in rooms range from nurseries with a large, sunshiny nursery and diet kitchen for the babies, and adequate playrooms for the children, down to nurseries like the one where as many as two hundred children are crowded in two rooms, with a trough for washing, one toilet, no towels, and no place to lie down (pp. 15-16).

Basing her evaluation on the laws and ordinances of various states and cities, the minimum standards of the National Federation of Day Nurseries, the Philadelphia Association of Day Nurseries, and on the "Study of the Day Nurseries of Philadelphia" made by the Child Federation of that city in 1916, Mrs. Tyson further described requirements for rooms:

Two playrooms, for the large and small children; a nursery with cribs for children under three; a kitchen; dining room; laundry; isolation room; one toilet for every fifteen children at least; one wash bowl for every ten . . . . (p. 16).

Some authors, writing as individuals or speaking for agencies, have indeed specified an amount of space. As early as 1919 the Education Act of Great Britain (Great Britain Board of Education, 1919) demanded: ". . . not less than 12 to 15 square feet of floor space per child should be provided (p. 10)." In the same year in the United States the Second White House Conference findings (Baker, 1919) reported: "The kindergarten or playroom for the children from two to six years of age should provide at least fifteen

square feet of floor space for each child (p. 221)." This amount was echoed in 1923 by certain pioneers in school building planning. Strayer and Engelhardt (1923) wrote: "The minimum for elementary schools should be 15 square feet of floor space and 200 cubic feet of air space per child (p. 31)." That this amount received rather general acceptance is advanced by Caudill (1941) who observed:

The space required by each student is still one of the major problems confronting the architect and the educator today. Some conservatives still cling to the outmoded practice of using 15 square feet per pupil, while at the other extreme some authorities say that 40 square feet per pupil is necessary (p. 52).

. . . . .

Considering only the space used by furniture there should be at least 25 square feet of floor space per pupil to allow for building a house, or a grocery store, or a model of a city, or any other large project, this figure must be increased, as usually the chairs and tables are moved to the walls of the classroom to allow more space. Finally, then, it is recommended that each classroom have at least 35 square feet of floor space per pupil. This does not include toilets nor workshop adjoining the classroom (p. 54).

A continuing search through the writings of persons and agencies prominent in early childhood education since the 1920's in the United States revealed the measure of 35 square feet per child as the most often quoted amount of space. In 1931, the committee on standards for nursery schools within day nurseries in the National Association for Nursery Education (Langdon, 1931) declared: "The standards which follow are presented as minimum essentials which must

be met in case a group is to be called a nursery school (p. 129)." There followed a specific mandate: "There should be a minimum of 35 square feet of floor space per child, exclusive of hall, bathroom, and locker space (p. 132)."

In the same year, 1931, the National Federation of Day Nurseries, Incorporated, in its Day Nursery Manual (Bogue, p. 24) stated its position about amount of space: "For children 2 to 6 years of age, it is desirable to allow 35 square feet of floor space per child exclusive of hall, bathroom and locker space."

In Housing and Equipment (National Advisory Committee on Emergency Nursery Schools 1932-33) standards for school housing in the Work Progress Administration program were defined: "A minimum allowance of indoor space for each child under five years has been set at 35 square feet of floor space and 300 cubic feet of air space exclusive of bathrooms, coat rooms, halls, kitchen and storage space." It was noted also in this bulletin that even 35 square feet was recognized insufficient if the space enclosed did not allow for division into areas.

An early textbook on the education of young children (Foster and Mattson, 1939, p. 236) referred to the emergency nursery school bulletin and advised, "The playroom should be roomy enough to allow the children to move about freely, perhaps some thirty-five square feet of floor space and

three hundred cubic feet of air space for each child."

For a second all-out federal government effort, the Lanham Act for war-time pre-schools under the Federal Works Administration established space requirements. Alschuler (1942, p. 102) spoke for the National Commission for Young Children: "A minimum allowance of indoor space for each child under five years has been set at 35 square feet of floor space and 300 cubic feet of air space exclusive of bathrooms, coatrooms, halls, kitchens, and storage space."

Some groups have recommended space requirements beyond 35 square feet per child. Reference has been made in Chapter I to the position of Child Welfare League of America (1960) and to its recommendation about space for kindergartens in North Carolina (North Carolina. Report of the Governor's Study Commission on the Public School System of North Carolina, 1968). Another professional group, the Association for Childhood Education International, in its 1953-55 Plan of Action recommended in Area II, "Many suggest that the minimum should be: per nursery school child, fifty square feet; per kindergarten child, forty square feet (Heinz, p. 351)."

A number of interested-in-space educators and designers have refrained from quantitative measurement. A widely acclaimed architect (Haskell, 1938) observed:

Room size depends on the age and number of children served and the activities allowed them. Activities vary so widely from school to school as to render

computation of area in terms of square feet per child almost meaningless (p. 88).

Hammond (1963, p. 327) was equally flexible and suggested: "In planning for space, consideration needs to be given to the provision for adequate amounts of indoor and outdoor areas according to location, situation, and climate."

Waechter (1968) declared the "so-called standard of 35 square feet . . . 'antiquated' and its origin hard to trace."

It is already weak on account of being a two-dimensional standard. School rooms used to be considered by health authorities as a matter of sufficient lighting and ventilation (air volume and air changes).

. . . . .

The number of square feet floor area is also related to the efficiency in design. A room may add up to a lot of square feet and be less efficient than one with fewer square feet. Arrangement of functions, built-ins, movable equipment, traffic flow, visual extension of space, etc. have to do with that efficiency. The whole environment has to serve particular teaching methods which may, in conjunction with out-door spaces, require a very diversified use of space, and more square feet, or a compact space with mostly tables and chairs as with Bereiter's cognitive methods for academic learning of disadvantaged five year olds (p. 2).

Despite the prevalence of historical references to space conditions for children in group settings, this investigator found no research which described the origin or reason for the specific minimum, maximum, or optimum amount of space. A similar conclusion was advanced by a spokesman (Heinz, 1954) for the Association for Childhood Education

International. In reply to the question, "What are the greatest needs of children?" she wrote editorially:

This question was sent to ACE . . . in the spring of 1952. The problem of crowding in schools--too many children per room and too little space per child both indoors and out-doors--was included in most of the answers received. Research bulletins, books, and educational magazines were studied. Inquiries were sent to many sources such as the U.S. Office of Education, Research Division of the National Education Association, National Association for Nursery Education, and to individuals in the field of education to discover recent research concerning recommended size of class and space children need in school and on the playground. All replies brought the same answer--no genuine research on this problem available. Most standards for class size and for space per child are simply expert opinion based on experience (p. 351).

A librarian's search (Barnes, 1968) in the Historical Library at Merrill-Palmer Institute strengthened the case for "expert opinion" rather than scientific investigation:

I consulted our specialists, Dr. Marjorie Sanger and Dr. Dorothy Haupt. They have stated they have no idea. They doubt that the figure (35 square feet per child) was based on research--more likely (the) considered judgment of a group of professional people in those early days (p. 1).

The Journal of Nursery Education (National Association for Nursery Education, 1962) devoted most of an issue to "Where Do Standards Come From?" but did not acknowledge any research as a basis for recommending amount of space.

Two sources strongly suggested that the basic reason for the usual standard of 35 square feet per child was related to a health factor--specifically, the requirement for space between cots when children are sleeping or resting.



Nichols (1947) made this observation:

The space allowance per child will depend somewhat upon his age or in other words, upon his work and play needs. In any case, when the group rooms are used for resting, the space per child cannot fall below that required for the setting up of cots. This is generally accepted as thirty-five square feet--roughly an area five by seven feet--to allow space around each cot for separation and access. Some additional space per child is desirable, however, particularly for the youngest groups where the number of pupils is small but where the facilities they require are not diminished thereby (p. 261).

Comments by Goldsmith (1959) and recent correspondence with Golden (1968) strengthened the opinion that the space needed for the healthful placement of cots was the basic reason for the general standard of 35 square feet per child. Goldsmith wrote that day care had been regulated by the sanitary code of New York City since 1895. She further explained that because of citizens' concern in 1942, a new code was approved in 1943 by the Board of Health. This present investigator addressed an inquiry about this code and its reference to space conditions to Goldsmith and later to Golden, Early Childhood Consultant to the Department of Health, the City of New York. The following excerpts from Golden's letter were enlightening:

The current regulation in the New York City Health Code regarding floor space for each child in any group for children between the ages of two and six years, is 30 square feet of wall to wall space. If sufficient appropriate equipment is placed in a room, the 30 square feet requirement will not allow space for setting up cots. In a half-day program when cots are not used, the 30 square feet requirement is still inadequate because it does not allow for enough free space for block building and the

many other activities in their program.

Consequently the Division of Day Care in the Department of Social Services which funds the day care centers, raised the floor space requirement for their centers to a minimum of 35 square feet per child. In other words, they went beyond the 30 square feet minimum legal requirement because it is inadequate. This has been in effect for many years. The N.Y.C. Housing Authority used the 35 square feet per child measurement when they built the day care centers in the City housing projects.

I shall try to trace the origin of this space requirement, as far as I know it. During the war period, a group of civic minded citizens were concerned about the substandard, hazardous conditions in a variety of day care groups operating in New York City. Dr. Leona Baumgartner, our former Commissioner who was then the Director of the Bureau of Child Health, set up a committee consisting of pediatricians, nurses, early childhood educators, social workers and lay citizens, to draft minimum standards to protect children. The old Section 198 of the Sanitary Code of the City of New York was revised in February 1943 to incorporate these standards as legal requirements. The space requirement at that time was 20 square feet for each child exclusive of equipment, i.e. space under tables, shelving etc.

The Health Department's Division of Day Care was then set up and was made responsible for giving consultation to improve programs and for licensing them. When I joined the consultant staff in 1945, we made initial visits to the nurseries, kindergartens, day care centers, etc., jointly with the Sanitary inspectors. The latter inspected the premises for sanitary conditions, measured the wall to wall floor space and then subtracted the floor space covered by equipment. We found that 35 square feet was needed in order to provide for equipment and for the children's activities. This will not even allow for the 2 feet separation between all the cots, to which you make reference.

When the Sanitary Code was revised in 1959 and re-named the Health Code, the hope was that 35 square feet could be made a legal requirement. However, because of pressure from proprietary nurseries and kindergartens and because of the space shortage

in this city, a compromise was made. Only 30 square feet of wall to wall space became the legal requirement.

In regard to cubic feet of air space, the requirement was made in 1943 because there were many programs conducted in basements with 7 and 8 foot ceilings - not allowing for sufficient ventilation. Since such basements are not allowed now and since buildings now have higher ceilings and better ventilation - the requirement regarding air space was not needed.

This portion of the literature review may be summarized by stating that persistent searching of the journals, reading, questioning, and correspondence has increased support for the belief that space recommendations have been the result not of research but rather of speculation, experience, and opinion, largely influenced by awareness of health factors.

#### Aggression and Amount of Play Space

Only two studies (Jersild and Markey, 1935; Murphy, 1937) were found which indicated that the amount of space in which young children play may be related to the amount of anti-social aggression among them. A third investigation (Green, 1933) implied a relationship between these variables when it revealed that sand box play was the occasion for the most frequent quarreling among pre-school children. In none of these investigations was the factor of space used as a controlled variable in an experimental design. Rather, the cautious conclusions about association between space and aggression were the result of the considered judgment and

speculation of perceptive observers after the data were analyzed.

Jersild and Markey (1935) obtained and later analyzed observational diary records on the indoor and outdoor play of 52 nursery-age children in three preschool groups. The aim of the investigation was:

To study the frequency and apparent causes of children's conflicts with one another, the roles played by different children in conflicts, the frequency of various methods of aggression, attack, and defense, the methods used by different children in solving their differences, the outcome of conflicts, the behavior of adults toward children's altercations, and individual differences in frequency of conflict as well as in methods of aggression and defense as related to one another and as related to such factors as age, sex, intelligence, and socio-economic status (p. 1).

These investigators drew certain conclusions about space in their general summary:

One factor that appears to be important is the extent of the children's play space and facilities. The older nursery school groups, which exhibited the smallest amount of conflict behavior, had the use of a large outdoor playground; the remaining two groups occupied more restricted playgrounds on the roofs of buildings; the play facilities of the day nursery group, which led in frequency of conflicts, were most restricted in proportion to the size and number of children present (p. 162).

A second study (Murphy, 1937) evaluated amount of play space. In a broad pursuit of the psychology of childhood sympathy, Murphy chose as a focal point the analysis of children's responses to distress in other children. Observations of two groups of young children on playgrounds for 432 hours were "the heart of the study (p. 14)."

Group W, 20 children from 37 to 47 months of age, played on the roof of their nursery-school building and had about 2,000 square feet of play space, including the sand boxes. Group H, 19 children from 28 to 54 months of age, played in a large playground covering approximately 15,000 square feet.

Murphy made four points about the possible relationship between amount of space (100 and 789 square feet per child respectively for groups W and H) and the fact that aggression was more frequent in Group W.

The reasons for these differences have not been quantitatively substantiated, but among the differences in the circumstances in which the groups play, the following are worth noting:

Group W, which has the greatest number of conflicts, has a much smaller play space in proportion to the number of children, which means that there is probably more physical contact imposed by the external situation (pp. 66-67).

. . . . .

In this connection it is interesting to note that for three successive years, groups occupying the present quarters of Group W had shown high conflict scores, as compared with groups in the quarters of Group H. It looks, further, as if the smaller amount of space (and of properties and play materials) put a heavier competitive pressure upon the children on the one hand, and contributed to more frequent physical contact on the other hand, both of which might tend to increase conflicts and unsympathetic responses. These conflict and unsympathetic behavior scores might be a simple consequence of the greater likelihood of physical contact in the smaller play area or they might be evidence of psychic tension created in children who were sensitive to the pressure of narrower quarters and the closeness of so many people (p. 128).

. . . . .

In psychological terms, thresholds for aggressive, defense, and conflict behavior were lowered among the children of this group (W) generally (p. 129).

.....

Children in Group W, which had the narrower age range and smaller play space, showed fewer sympathetic and more unsympathetic responses, in proportion to their number; while Group H, which consisted of a group of older children and "babies," in a larger play space, showed more sympathetic responses and fewer unsympathetic ones (p. 158).

Updegraff (1947) in commenting on a group of studies that included Jersild and Markey (1935) and Murphy (1937) observed:

Whether the greater number of conflicts in the small play space was due to the greater likelihood of physical contact, thus offering more opportunities for conflicts, or whether it was due to tension created in children who felt "closed in" was not determined (p. 186).

.....

As a group, these studies imply that a spacious physical environment, well equipped with play materials, is probably more conducive to sharing and positive social behavior than the small, meagerly equipped space (pp. 186-187).

Swift (1964) made a similar appraisal of the Jersild and Markey (1935) and the Murphy (1937) studies as well as "the sand-pile research" of Green (1933) and concluded: "In general, these studies have shown that conflicts between children are more numerous where play space is more restricted (p. 260)."

This review of the literature has led to the conclusion that no research has been published which has systematically investigated either optimum space for children in

groups or the relation of amount of space to frequency of hostile aggression.

## CHAPTER III

## METHOD AND PROCEDURE

As has been indicated in the foregoing chapters, anti-social aggressiveness among young children in group settings may be buried among many variables--one of which may be the ratio of amount of space to number of individuals. Holding as many factors constant as possible, the purpose of the method described here was to search for indications of the effect of amount of space on children's aggressive contacts and through perceptive observations and recording to show how aggression may be affected by space conditions. The method and procedure herein described were designed to develop a technique and an instrument for detecting differences in physical aggression as they may be affected by space conditions in the functioning of a group setting and to estimate the amount of observation required to detect such differences in an experimentally arranged setting.

The experimental design called for observing children, two to five years of age in day care centers, in systematically controlled space accommodations of 20, 35, and 50 square feet per child. The focus of observation was the frequency of aggressive contacts within a specific space



environment and within a controlled time span. It was hypothesized that there would be no differences in the frequency of aggressive contacts in varying amounts of play space.

### Subjects and Setting

Thirty children from two United Day Care facilities in Greensboro, North Carolina, participated in this study for one hundred forty-five 5-minute observations. All children were Negro and ranged in ages from two years and five months to four years and eleven months. From a total enrollment of 15 in the youngest group of each center, seven children were randomly selected each morning of the experiment.

Center A, the oldest community-funded day care service, had three separate groups of children and a total staff of six teaching persons. Center B, more recently organized, had only one group (separated for some occasions) and a teaching staff of three. Staff training in the two centers was comparable as were stated attitudes toward anti-social aggression. The director of Center B previously had been the assistant director at Center A for twelve years. When points of view about aggression were discussed prior to the study, the director of Center A seemed to summarize the philosophy of the two centers by stating that they tried to let children take care of themselves as long as no one was a bully.

Prior to the investigation the experimenter visited with the directors whom she had known previously through an earlier professional contact. She explained the proposed study, asked for opinions regarding its feasibility, and consulted about the specific adaptations in the total program which such a study would demand: a consistent schedule; the same teachers; a separate place for play for children who were not selected for an observation; rainy day contingencies; early arrivals on the part of the observers; the installation of casters on the heavy lockers used for partitioning; appointments for the investigator and her assistant to return to the centers to observe, to practice recording, to measure floor space, to become "accepted."

Particular emphasis was placed upon the role and function of the one teacher assigned to the experimental group in each of the centers. She was to be the same person each day; she was to plan, decide and act in the way she usually participated in the free play and grouptime activities. It was agreed that free play is a free choice activity engaged in by children. Grouptime activity is structured, teacher-initiated and teacher-directed. Examples of indoor free play were cited: block building, playing house, pushing wheel toys, working puzzles. Grouptime examples were suggested: hearing stories, singing, dancing. It was further agreed that free play would be observed between 8:35 and approximately 9:05 each morning

and that grouptime observation would be a 10-minute period (two 5-minute units) following snack. This amount of time was thought to be the length of time the teachers normally expected children to participate in a group activity.

Selection of the order in which centers would be observed was decided by tossing a coin. Center A was selected for the first two weeks of observation.

#### Experimental Conditions

The design required observations of aggressive contacts during the usual "free play" and "grouptime" activities in the two day care centers. Two space conditions were arranged each morning of observation: One amount of floor area (square footage) was allowed for free play; another set of dimensions for floor space was arranged for the grouptime activity. One of three pairs of space conditions was used once during three days of observations on Tuesday, Wednesday, and Thursday of one week in a center. In the following week the identical space pairs were used on the same day of the week in the same center, but each pair was reversed in its order. Days of the week were randomly assigned to pairs of space conditions for the two weeks at Center A and then this same random assignment was used in Center B (Rand, 1955). Table 1 shows the order of space conditions to weeks and the assignment of days to space conditions which was made prior to the experiment. The order of each pair of

space conditions was made by flipping a coin prior to the random assignment of days and weeks.

TABLE 1  
Space Conditions, Weeks, and Days

Weeks Days	1 Tuesday	2	1 Wednesday	2	1 Thursday	2
Space Conditions (square feet per child)						
Free play	50	35	20	50	35	20
Grouptime	35	50	50	20	20	35

Space variation was manipulated and controlled by the arrangement of portable wooden lockers which each center used for children's personal belongings. Thus, a "room" for any space condition was arranged twice daily in a matter of a few minutes--before children arrived and during the "getting-ready-for snack" period between free play and group-time. The shapes of the "rooms" were rectangular under all space conditions. Table 2 indicates the adaptations made in room area.

A room thus arranged within a larger room had two permanent walls and two walls of lockers. The latter expanded or contracted as space conditions in the experiment dictated.

TABLE 2  
Space Conditions and Dimensions

Space Condition Per Child	No. of Children	Total Square Feet	Dimensions Enclosed
20 square feet	7	140	10'x14'
35 square feet	7	245	17.5'x14'
50 square feet	7	350	17.5'x20'

#### Definition of Aggression

Aggression, as a direct, hostile, primitive expression, may be either physical or verbal, obvious or subtle. In this research verbal responses were ignored and aggressive contacts were broadly defined as "physical interference by a child on the body, the possessions, or the space of another person who gives evidence of resistance to interference."

Following a period of inquiry and trial observations, specific definitions of aggression and directions for recording aggressive acts were formulated by the investigator and agreed upon between observers. These were:

1. Aggressive acts are characterized by the absence of mutual laughter or other signs of playful, commonly-shared give-and-take. Tussling, jostling, good-natured colliding, and poking at one another, though these acts are physical interference, are not necessarily aggressive contacts. When,

however, there are no signs of mutual jesting, the acts of interference listed on the 5-minute Measures Card (Appendix A) are considered aggressive contacts.

2. When a child's act is subtly indefinable (e.g. "joins uninvited"), the fact that another person uses protest words or attempts protective action to ward off possible action indicates the presence of an aggressive act and shall be recorded as such.

3. Contacts which may not be aggressive in the beginning may become aggressive in the midst of playfulness. When one participant gives evidence (failure to laugh, smile, tease, etc.) that the contact in progress is no longer mutually desired, a tally for "aggressive" contact shall be recorded.

4. Always record the throwing of a dangerous object (whether or not it is aimed at a particular person).

5. An aggressive act is a single unit of behavior, calling for a single tally, as long as the same children are involved without interruption from another person or another object. Aggressive acts are separate incidents when there are interventions of another person, another piece of play equipment, withdrawal of either party, or the passing of one unit of "look-record" time (see Measures Card, Appendix A) without aggression.

### The Instrument for Recording

Using the Jersild and Markey (1935) method as a starting point, the investigator developed a measures card for observing and recording anti-social aggression (Appendix A). In this study, aggression was limited to physical interference and the observers were instructed to record aggressive acts as they occurred. In contrast, the Jersild and Markey investigations also included verbal aggressions and observers did not make decisions about aggression. Instead, their diary observations were examined at a later date for aggression items.

The measures card for the present investigation retained the Jersild and Markey divisions of "Physical Acts of Aggression . . . Around Material, Space, or Activities," and "Physical Acts of Aggression . . . Around Attacks on Another's Person (pp. 19, 201)." These titles were simplified, however, in the present study to: "Interference with Materials, Space, Activity," and "Interference with Person."

Four 5-minute units of observations of free play were separated by rest intervals of one to three minutes. Two 5-minute units of observation without rest intervals were used for recording during group activities.

### Daily Procedures

The investigator arrived at a selected center between 7:30 and 8:00 A.M. each observation morning. She greeted

the few children and adults who were already present, arranged the room for the space condition to be used in free play, and marked the children's attendance as they came into the center. At 8:30 on each of the days she randomly selected seven children to play in the experimentally arranged area. All children not selected played in another area of the large room, divided by the wall of lockers.

The second observer arrived by 8:30. At 8:35 the two observers who sat side by side at the edge of the "arranged" room area began timed observations of free play among the seven children selected for the particular space condition of the day. The investigator held a stop watch and indicated, "look" and "record" at 1-minute intervals; 45 seconds in each minute were given to looking for aggression among any of the seven children while the last 15 seconds was used for recording any aggressive acts detected. If there were no such acts to record during the 15 seconds, the observers kept their heads lowered during this period. Barring infrequent emergencies (e.g., a child's leaving the room temporarily), observations of free play were completed by 9:05.

At this point of time in the morning scheduling, preparation for a "snack" time occurred. The seven observed children went to the bathroom and returned to wait at a table until all seven were prepared for "snack." During this interval between free play and "snack" time, the



investigator and her co-observer re-arranged the floor area to its new pre-assigned dimensions by pulling in or pushing out the portable lockers.

When the children finished at the snack table and gathered for the group activity, the investigator and her co-observer again made timed observations. During these weeks of observation the children participated as a group in a variety of activities: hearing stories read or told; singing; playing games; working puzzles; following recorded directed rhythms. As has been indicated previously, it was possible to make two 5-minute units of observation of group activity in contrast to the four 5-minute units of observation in free play. The reason for this difference was the pre-experiment recognition that these children were accustomed to brief group activities.

At the end of each morning's observation, the co-observer gave her measures cards to the investigator who daily transferred the frequency information to a total fact sheet necessary for later data analysis.

#### Observer Agreement

The procedure described by Jersild and Markey (1935, p. 45) was used in this present investigation to calculate percentage of agreement between two observers:

In the case of each observer's data a tally was made of items that definitely could be identified as being similarly recorded by the other observer; to this count was added a tally of all items recorded

by one observer and not the other. The former tally constituted the numerator, and the latter the denominator.

Table 3 shows the extent of variability of observer agreement during the four weeks of observation.

TABLE 3  
Percent of Observer Agreement

Week	Center	Tuesday	Wednesday	Thursday
I	A	92.5	96.3	82.7
	B	99.3	93.7	90
II	A	97.5	97.5	95
	E	94.1	90	96.3

## CHAPTER IV

## ANALYSIS OF DATA

The experimental design for this study may be viewed as a randomized complete blocks design (Golden, 1952, p. 196; Ray, 1960, p. 245). There were four blocks--two weeks in each of two day care centers. Each block contained three days which were assigned to ordered pairs of three possible space conditions. As has been described in Chapter III, the assignments of days to space conditions were made randomly for the two weeks at Center A and then this same assignment was used for Center B. The three days were the three middle-of-the-week ones; this choice of days was based on the opinion often expressed by teachers that Mondays and Fridays in group settings for young children are "different" kinds of days.

The frequency of aggression observed within the randomized block arrangement is shown in Appendix B. These data reveal that the Free Play and Grouptime periods were quite different in levels of aggression, there being about 2.4 times as many acts of aggression in the same period during Free Play as during Grouptime. For this reason, Free Play was analyzed separately from the Grouptime data.

### Analysis of Free Play

Under the Free Play conditions 96 observations were obtained. There were 12 days, each with four 5-minute periods for observation, and with two observers. The variation among the 12 days reflects the treatment differences and the blocking effects.

The frequency data reported in Appendix B denotes that in Week II at Center A under the most confined space condition, 20 square feet per child, there was a low frequency of aggressive acts. This count was apparently due to the fact that two children on this day played at being puppy dogs and/or babies for the entire period of observation. The investigator's notes report: "And no one hits or otherwise aggresses against babies and puppy dogs; one only pats and talks gently."

As a result of this incidence in which children initiated a form of behavior not previously anticipated or defined as aggressive, the recorded low frequency value for this day (on the advice of the statistician) was declared an "outlier" or "missing value." In its place, in order to preserve the balance of the original design, a value of 24.33 was "fitted" for this period when children played puppy dogs and babies. (See calculation which accompanies Table 4).

Table 4 shows the sums of aggressive acts in Free Play recorded by both observers, by space conditions and

blocks, and indicates the substitution of 24.33 in Center A, Week II. The accompanying calculation shows how a formula (Goulden, 1952, p. 318) was applied to achieve the value of 24.33. (The recorded sum for both observers was 4, but 24.33 was used in the calculations for the analysis of variance).

TABLE 4  
Sums of Aggressive Acts in Free Play

Space Condition	Center Week	B		A		Sums
		I	II	I	II	
20 sq.ft.		19	30	20	24.33	69=R <sub>1</sub> (98.33)
35 sq.ft.		24	9	25	15	73
50 sq.ft.		7	4	13	15	39
Sums		50	43	58	30	181 = G
				<sup>c</sup> 4 = (54.33)		205.33

Calculation for "Fitted" Value

$$\begin{aligned}
 X_{14} &= \frac{cC_4 + rR_1 - G}{(c-1)(r-1)} \\
 &= \frac{4 \cdot 30 + 3 \cdot 69 - 181}{3 \cdot 2} \\
 &= 24.33
 \end{aligned}$$

A comprehensive analysis of components of variance (Proctor and Swattee, 1968) based on a 5-minute unit of observation for one observer, includes a section which shows the effects of space conditions on Free Play (Appendix C). The sums of

squares using the fitted value were calculated as for a two-way, space conditions by center-week, analysis of variance. However, the block by treatment sum of squares is assigned 5 instead of 6 degrees of freedom (Ray, p. 246) while the treatment sum of squares shows a bias (Goulden, p. 320) of 7.2588 and thus was corrected in accord with the standard methods for dealing with missing values in analyses of variance.

The F ratio of 5.138 was above the 10% point, while the  $t=2.27$  was beyond the 5% one-tailed level critical point (2.015). Thus the data gave evidence of the increase in aggressive acts as space for free play was reduced.

The size of the effect is best appreciated by examining the data in Table 4 and calculating the mean numbers of aggressive acts per five minutes at the three space conditions:

2.9 acts among 7 children in 5 minutes at 20 sq. ft.

2.3 acts among 7 children in 5 minutes at 35 sq. ft.

1.2 acts among 7 children in 5 minutes at 50 sq. ft.

From these averages it can be seen that the average change was about one aggressive act for each reduction of 15 square feet. The actual estimate was  $.85 \pm .38$ . This was calculated as the standard error of the regression coefficient in a multiple regression program. Therefore, the experiment showed that there was an effect of space conditions on Free Play but that the standard error of the estimate was still

quite large.

#### Analysis of Grouptime

The design for the analysis of the Grouptime data was the same as that for Free Play; there were, however, as has been indicated in Chapter III, two 5-minute periods of observation in Grouptime instead of four periods as was true in Free Play. Under the Grouptime conditions no effects of space were detected. The analysis of variance on these conditions is shown parallel to the analysis on Free Play (Appendix C).

#### Concerning the Null Hypothesis

The null hypothesis, that there would be no differences in the incidence of physical aggressive contacts in varying amounts of space, was rejected for Free Play conditions but accepted for Grouptime conditions.

#### Effects of Varying the Design

The effects of varying the design and of increasing the size of the experiment were calculated. If only free play were observed and one observer rather than two were used, the variances of the estimates for a period would be increased 4.5%. This estimate was calculated in the following way:

$$\begin{aligned} \text{Variance of a period mean with 2 observers} \\ = 2.4145 + \frac{.2604}{2} = 2.5547 \end{aligned}$$

Variance of a period mean with 1 observer  
 $= 2.4145 + .2604 = 2.6749$

(Where 2.4145 = a re-estimated period-to-period component. See Appendix C and Appendix D, Re-estimation of Period-to-Period Component). Thus  $\frac{2.6749 - 2.5547}{2.6749} = 4.5\%$ . The reason two observers were used in this experiment was to enable such an estimate to be made.

It might be possible to increase precision in future studies if two free play sessions rather than one were observed on each of the experimental days. To anticipate the increase in precision obtainable from lengthening the observation session from four 5-minute periods to eight, the following variances are useful:

Variance of a day's mean with 4 periods =  $2.6749/4 = .6687$

Variance of a day's mean with 8 periods =  $2.6749/8 = .3344$

Thus it appears possible to reduce the variance by

$\frac{.6687 - .3344}{.6687} = 50\%$  through doubling the length of the daily period of observation.

Other possible changes in the design were evaluated. The total size of the investigation and how precisely the space effects of interest can be estimated are considerations for future studies. Of primary interest to the investigator, it would seem, is the linear treatment effect that was estimated from this present experiment at .85 aggressive acts per 15 square feet. Because of the small size of the quadratic or non-linear effect, it might be wise in future



studies to increase the number of observations on 20 square feet and 50 square feet while observing at 35 square feet only rarely.

If observations at 35 square feet were made only once for every four observations at each of 20 and 50 square feet, and only four periods per day with one observer were used, then for a survey size of 27 total days the variance of the estimated linear effect will be as the difference in two means each having 12 days of observations or:  
 Variance of  $(\bar{X}_{20} - \bar{X}_{50}) = .6687 \left( \frac{1}{12} + \frac{1}{12} \right) = .1115$  with a standard error of  $(\bar{X}_{20} - \bar{X}_{50}) = .334$ . The difference itself would be of the order of two aggressive acts (since the treatments are 30 square feet apart) and the coefficient of variation becomes  $.334/2 = 17\%$ . This is not generally regarded as a very small coefficient of variation but to reduce it by half to 8.5% requires quadrupling the size of the experiment from 27 to 54 days. This latter case represents 18 center-weeks or 3 weeks at each of 6 day care centers and then the estimate would have fair precision. It should be noted that this investigation was carried out with only 4 days at each of the space conditions or 12 total days and achieved a coefficient of variation of 44%.

## CHAPTER V

## SUMMARY, FINDINGS AND RECOMMENDATIONS

The purposes of this study were twofold: (1) to inquire into the origin and significance of historically recommended amounts of indoor space needed for young children in group settings; and (2) to conduct an experiment which would search for the effects of variations in amounts of indoor space on the frequency of physical aggressions among young children in group settings. For this experimental study a null hypothesis was proposed: There will be no differences in the incidence of anti-social physical aggressive contacts in varying amounts of space.

The experimental study was conducted in two United Day Care Centers in Greensboro, North Carolina. Thirty Negro children from the younger groups in each center, ranging in age from 2 years 5 months to 4 years 11 months were the subjects of a total of one hundred forty-four 5-minute units of observations. In each center, for a period of two weeks, three days per week, the amount of floor space for a randomly selected group of seven children was controlled by the use of movable wooden lockers. "Rooms" of specified area (50, 20, or 35 square feet per child per occasion) were arranged twice each morning of the experiment--before

the children arrived for free play, and in the interval when children toileted before mid-morning snack and a group-time activity. Two observers, using a specially designed measures card, tallied physical aggressions as they saw them occurring during the observational periods designated as "Free Play" and "Group-time."

The design was a randomized complete blocks design. There were four blocks--two weeks in each of two day care centers. Each block contained three days which were assigned to ordered pairs of three possible space conditions. An analysis of variance was used to search for a possible relationship between variations in amount of play space and the frequency of anti-social physical aggression.

### Findings

In the review of literature the investigator found no systematic research in which amount of indoor space was used as a variable. Two studies (Jersild and Markey, 1935; Murphy, 1937) after data were analyzed, acknowledged a possible relationship of space to anti-social aggression.

The literature did point, however, to the fact that 35 square feet per child (excluding space for toilets, kitchen, storage, etc.) was most often recommended or required as a minimum space allowance in programs for young children. Apart from "considered judgment" of experts and practitioners, the most convincing and systematic argument

for 35 square feet per child was the need to meet public health standards for the proper spacing of children's rest mats and/or sleep cots in day care centers.

The analysis of data in the present study revealed evidence of an increase in aggressive acts as space for free play was reduced from 50 to 35 to 20 square feet per child. The average change was about one aggressive act for each reduction of 15 square feet, the actual estimate being  $.85 \pm .38$ . In the group time periods no effects of space conditions were detected.

The effects of varying the design and of increasing the size of the experiment were calculated. It was pointed out that fair precision would be achieved if a future design required three 3-day weeks at each of six day care centers, noting, however, that the present investigation achieved a coefficient of variation of 44% with 4 days at each of the 3 space conditions.

### Conclusions and Recommendations

A search of the literature on housing young children in group programs and the results of this experimental study prompt the investigator, who is also a practitioner, to draw the following conclusions.

1. This study showed that one aggressive act per five minutes appeared in free play for each reduction of 15 feet of floor space. To generalize on a wide basis

concerning this fact is not possible. There is, however, an implication about the use of space for the two centers that participated in this study and perhaps for other similar settings: It seems likely that teachers would have fewer aggressive episodes to cope with if they planned to equate the number of children at play with a room area of specified size at any given time. An alternative to decreasing enrollment in a center could be arranging indoor-outdoor play for alternating small groups instead of planning for all children to be either indoors or outdoors together in a single free play period.

2. Practitioners and scientific observers alike are urged to re-examine casual and traditional definitions of physical anti-social aggression. Statements of relationship between space and aggression should be qualified by careful definition of what is meant by aggression. This investigator, under the circumstances of making intensive observation, was particularly impressed by the frequency of aggressive physical contact which could not be recorded as anti-social. There were occasions in the experimental study when one child apparently liked the wrestling attempts of another child. There were frequent moments of mutual laughing about jostling, snatching and running, punching or poking. Not to be overlooked was the 20-minute period during this experiment in which two children played that they were puppies or babies. As they "crawled" around, they

"bothered" other children--intruding on space, grabbing, and demanding inordinate attention. Yet no one "aggresed back" in the traditional sense of hitting, snatching, or threatening. Instead, there was petting and gentle talk.

Because of her observations of some of these responses during a time prior to the actual recording, the investigator developed a definition for aggression which distinguished between the aggressive acts of mutual enjoyment and those which expressed one-sided hostility/frustration.

3. Space requirements which are set in standards or licensing laws for group programs for young children should not fall below 35 square feet per child (excluding halls, kitchens, baths, storage). This minimum amount of space has been recommended consistently by practitioners in the field of early education. Though the opinions of these experts seem without benefit of systematic research, their accumulated experience of measuring space, arranging equipment in space for maximum usefulness, and of carefully observing children's social responses within varying physical environments, should be valued highly by persons who are presently responsible for setting standards.

Added to these considered judgments of early childhood educators are the existing public health regulations in some states and cities which require 35 square feet of floor space as the safe and necessary minimum to allow for space

around cots for rest or sleep.

4. Decisions about additional amounts of space beyond this recommended minimum should take into account the following factors: type of program(s); climate and the availability of an outdoor play/living area; ages of children; shapes of rooms; the meaning of space for children. For example, a program (or any part of a program) which is concerned chiefly with formal procedures will need less space than will a program in which exploration, discovery, and interaction in the physical environment are a desired part of the curriculum. Likewise, in a geographical location where year-round weather is mild, perhaps the "shelter" and necessary convenience which a building provides need contain only minimal space while the accompanying outdoor component should be enlarged.

#### Suggestions for Future Studies

As a result of her reading, her participation in this experimental study and the findings thereof, this investigator has satisfied her interest in the origin and rationale for historical statements about minimum indoor space for young children in group programs. She has likewise discovered evidence of a relationship between amounts of indoor play space and anti-social aggression among young children in two group programs. On the basis of this total experience and from the position of practitioner-observer as well as

investigator, she suggests that further studies of the space variable would continue to be productive as they also included other variables in relation to anti-social aggressive behavior. Some possibilities for such variables were suggested in Chapter I and are listed here again: group size; ratio of adults to children; arrangement of rooms; programmed training in social give and take; the presence in a group of one or more aggressive children who serve as models for others; length of day; sex; ethnicity; socio-economic levels.

Also closely related to this present study would be a design that included "verbal attacks," unintentional "bumping," and so called "passive" aggression (such as puppy and baby play noted in this study) as variables to be related to space for play.

Of scientific interest would be a study to determine the effects of even smaller amounts of space than those used in this study. At what point in space allowance is the greatest increase in aggressive acts?

Five additional suggestions are made for future studies, two of which are directly related to space conditions as was the present study. Three suggestions are the outgrowth of related study during the experimental investigation.

1. A design to study relationship between noise level and variations in work and play space, or between



fatigue of children and space variations.

2. A design to study teacher behavior in varying amounts of play space. In smaller areas she is inevitably "there," close to the children. How does proximity affect teacher initiative, interference, admonition, fatigue?

3. A design to observe children's behavior over a 5-day week in order to test the hypothesis that Mondays and Fridays are "different" days.

4. A research study to test the rationale of traditional public health recommendation and/or requirement for two or three feet separating children's cots. For example, do children in settings where this regulation is not followed have a greater incidence of colds than children in settings where this regulation is observed?

5. A study which would survey and evaluate the history of day care in the United States. Materials of this nature are meager and scattered.

#### A Personal Evaluation

Because of her exposure through this study to concentrated thought about the relationship of space to behavior, this investigator will observe and evaluate with increased interest the physical environments of group programs for young children. Moreover, she will have a larger reservoir of information from which to make judgments as she shares in decisions about space needs.

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APPENDIX A

Measures Card

Date \_\_\_\_\_  
 Recorder \_\_\_\_\_  
 Time \_\_\_\_\_  
 No. in group \_\_\_\_\_  
 Weather \_\_\_\_\_

Center \_\_\_\_\_ Activity \_\_\_\_\_ Space Condition \_\_\_\_\_

Five-Minute Unit: 1 2 3 4 5 6 7 8 9 10  
 (Circle one)

OBSERVATIONS		Minutes		1st		2nd		3rd		4th		5th		
I. Interference with materials, space, activity		Procedures	L	R	L	R	L	R	L	R	L	R	L	R
		Seconds	45	15	45	15	45	15	45	15	45	15	45	15
Snatches:	Takes, grabs, tugs, pushes or kicks materials, deprives of possession													
Reaches														
Intrudes on space:	Blocks path, cuts in ahead, joins uninvited													
Tampers with material														
Knocks down material														
Knocks into														
Throws														
II. Interference with person														
Touches, "handles," caresses person or clothing														
Pushes														
Hits														
Hits at (threatens)														
Spits														
Kicks														
	Pulls, twists, chokes, squeezes, bites, pinches others. (identify in checking, if possible, e.g. p = pulls; pi = pinches).													

Remarks:

## APPENDIX B

## Frequencies of Aggression

Center	Week and Activity	S P A C E	Tuesday Aggression per Five Minutes					S P A C E	Wednesday Aggression per Five Minutes					S P A C E	Thursday Aggression per Five Minutes				
			1	2	3	4	T		1	2	3	4	T		1	2	3	4	T
C E N T R A  C E N T R E R  B	Week I Free Play	50	5	0	2	0	7	20	1	4	2	3	10	35	1	5	3	4	13
	* Grouptime	35		1	0		6	50	2	3			10	20	0		2	5	12
		*					0		1	0			1		2				3
	Week II Free Play	35	1	1	2	4	8	50	2	2	3	1	8	20	0	0	1	1	2
	* Grouptime	50		0			7	20	1				7						2
		*		1	0		1		2	0			2	35	2	0			2
		*				1						2		1				1	
C E N T R E R  B	Week I Free Play	50	1	1	1	0	3	20	4	2	1	3	10	35	1	5	2	5	13
	* Grouptime	35	2				4	50	3	3	1		9	20	3				11
		*	3	0			3		0	0			0		2	1			3
	Week II Free Play	35	0	0	3	2	5	50	1	0	0	1	2	20	6	4	1	4	15
	* Grouptime	50		2	2		4	20	2	1		0	2		1	0			1
		*		1			3		0				0	35	1	0			1

\*The co-observer's recorded frequency when it differed with investigator's for 5-minute unit of observation. Also shown is the co-observer's total (T) recorded frequency.

## APPENDIX C

Analyses of Variance on Aggressive Acts Under  
Free Play and Group Time Conditions

Source	Free Play			Group		
	Sums of Sqs.	M.S.(DF)	and F-ratios	Sums of Sqs.	M.S.(DF)	and F-ratios
Linear Spacing	36.9012(1)		F = 5.138 <sup>a</sup>	1.1250(1)		F < 1
Quadratic Spacing	2.9387(1)			.3750(1)		
Center	.4168(1)			.1875(1)		
Weeks in Center	4.9239	2.4620(2)	F = .34	.0417	.0208(2)	F = .008 <sup>b</sup>
Experiment Error	35.9103	7.1821(5)	F = 1.52 <sup>e</sup>	15.8333	2.6389(6)	F = 2.39 <sup>f</sup>
Order of Periods	5.5312	1.8437(3)		9.1875(1)		F = 8.32 <sup>c</sup>
Order by Center	5.3750	1.7917(3)		1.0208(1)		
Residual Periods	142.2187	4.7406(30)		11.0417	1.1042(10)	
Observers in Periods	12.50	.26042(48)		2.50	.10417(24)	
Observers	.5104(1)			.5208(1)		F = 5.39 <sup>d</sup>
Observers by Day	.8646	.0786(11)		.7292	.0663(11)	
Observers by Periods	.8646	.2882(3)		.1875(1)		
O x D x P	10.2604	.3109(33)		1.0625	.0966(11)	
Grand Mean		2.14			.81	

<sup>a</sup>F<sub>.90</sub>(1,5) = 4.06; <sup>b</sup>F<sub>.01</sub>(2,6) = .010; <sup>c</sup>F<sub>.975</sub>(1,10) = 6.94; <sup>d</sup>F<sub>.95</sub>(1,11) = 4.84;

<sup>e</sup>F<sub>.75</sub>(5,30) = 1.41; <sup>f</sup>F<sub>.90</sub>(6,10) = 2.46



## APPENDIX D

## Re-estimation of Period-to-Period Component

For the Free Play condition the experimental variation was only a little more than would be expected (see  $F = 1.52$ , Appendix C) upon putting together four randomly chosen 5-minute periods. Thus the additional error component is estimated to be zero and the period-to-period component is re-estimated as:

$$\sigma_p^2 = \left[ \left( \frac{142.2187 + 35.9103}{35} = 5.0894 \right) - .2604 \right] / 2 = 2.4145.$$