

## Physical Environment and Child Behavior in Vienna Kindergartens

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The relationship between play-unit complexity and behavior of 24 normal 3- to 6-year-olds was examined in three Viennese kindergartens. Results showed that play-unit complexity had a significant relation to play-group size, degree of involvement, amount of pleasurable affect, and length of activity segments exhibited in a child's play. Although all three kindergartens were crowded, results suggested that architectural design (i.e., the number of rooms in the kindergarten) affected the incidence of interrupted play.

Although ecological psychology and environmental psychology have strongly implicated the physical environment as an important influence on behavior, the field of child development has not paid very much attention to this factor. Until the advent of the interdisciplinary *Children's Environments Quarterly* in 1984, there was no cohesive audience for research on this subject. Hence, the study to be reported, carried out in Vienna in the early 1970s, awaited the development of this journal to find its audience.

At the time of our data collection in Vienna, there was little published research available that had systematically investigated the effects of formal features of the physical environment on children's play. The physical playroom environment can vary along many dimensions including (a) the type and amount of equipment, (b) the arrangement of equipment within a space, (c) the arrangement and number of children within a space, and (d) the amount of space per child. Throughout the 1970s and 1980s, research on these environmental dimensions began to appear. In the light of this newer work, our study should be viewed as a cross-cultural extension of some of the findings to be discussed. In addition, our research is unique in assessing the behavioral effects of one specific formal feature of the physical environment—play-unit complexity. Finally, our study was able to differentiate the effects of crowding on children's play from the effects of the physical layout of space in a nursery school environment.

In spite of the general consensus that toys are important for a child's development, studies on this subject have been diverse in focus and frequently

inconclusive. This lack of focus and conclusiveness can be partially attributed to the diverse nature of the equipment found in playrooms for preschoolers. Playroom equipment can vary in many attributes: complexity, type of behavior encouraged, and accessibility, to name a few. Early studies, like those of Hulson (1930), Updegraff and Herbst (1933), and Van Alstyne (1932), compared particular play materials without trying to develop definitions of general characteristics that would correlate with behavior over a wide range of specific toys.

More recent studies have examined the effects of more versus less structured toys on the pretend play of preschoolers. Realistic playthings such as nurse costumes and Barbie dolls have been compared with less structured toys, toys that have more ambiguous or open-ended usages such as blocks and other construction materials. Conflicting results have been obtained by various investigators. Pulaski (1970) found that, although low-structure playthings elicited a broader range of fantasy themes, they did not lead to a more creative level of pretend play than did high-structure playthings. Dodge and Frost (1986) similarly concluded that the influence of structure is manifested in the diversity of play themes. In their purely impressionistic study, thematically structured settings elicited specific themes, whereas thematically neutral settings elicited a broader range of themes. McLoyd (1983), in contrast, found an increase in the range of fantasy themes with thematically structured playthings, as well as an increase in the amount of pretend play. The discrepancy in findings, as suggested by McLoyd, may be a result of the difference between studies in the amount of systematic exposure to the playthings during the experimental period and/or the difference in the degree of similarity between high-structure and low-structure playthings. It was more difficult to differentiate between high-structure

havior followed a decrease in equipment. Considering the inconclusive results of studies examining the effects of amount of space per child, Phyfe-Perkins (1980) concluded that, because increasing the number of toys per child leads to a decrease in aggressive behavior, an increase in the number of children per unit of space does not result in more aggressive behavior when the greater density is compensated by a corresponding increase in equipment.

Increased aggression is not the only consequence of changing the amount of equipment. For example, Busse, Ree, Gutride, Alexander, and Powell (1972), examined the effects of more or less play equipment on the cognitive and perceptual development of preschoolers. Using a battery of tests to compare children who had been in differentially equipped school environments, they found both desirable and undesirable effects of more equipment. In addition, children in the classrooms with "enriched" equipment spent more time than children in "control" classrooms cooperatively playing with toys (Busse, Ree, & Gutride, 1970). However, unlike our study, there was no attempt to find out what kind of equipment produced what kind of effect.

Clearly, many environmental variables affect play behavior. The interrelation of the variables and the frequent lack of conclusive findings warrants further research in many areas. Our study concentrated on one aspect of the indoor physical environment—play-unit complexity—and looked at its effect on children's play in Viennese kindergartens.

Prescott, Kritchevsky, and Jones (1972) suggested that play equipment be analyzed in terms of complexity, proposing that more complex objects offer more possible activities and, thereby, increase the potential for group play. Kritchevsky (1967) used play-unit complexity as one element in a measure of outdoor space quality. She found a large effect of space quality on teacher and child behavior: The higher the quality of the play yard, the more sensitive and friendly were the teachers and the more interested and involved were the children. An experimental study by Teets (1985) used Kritchevsky's scheme for rating quality of indoor space. Most relevant to our study, Teets found that higher quality physical environments increased interaction between children and increased children's involvement with materials.

Using the categories of complexity defined by Kritchevsky (1967; Kritchevsky, Prescott, & Walling, 1969; Prescott et al., 1972), our study sought to determine the effects of play-unit complexity on five variables. These variables, defined by Prescott et al. (1972), were (a) aborted play segments, (b) length of complete activity segments, (c) social structure (i.e., size of the play group), (d) degree of involvement, and (e) affect. Although we were not primarily interested in sex differences, we explored the possibility

that physical environment, specifically the environmental variable of play-unit complexity, would have a differential effect on boys and girls.

## METHOD

### Experimental Design

Children served as their own controls in a repeated-measures design in which each child's play behavior was observed until he or she had completed an activity segment (4 min or longer) at each type of play unit (level of complexity)—single, complex, and super.

### Subjects

Subjects were 24 normal 4- and 5-year-olds attending one of three kindergartens in a working-class district of Vienna. All three kindergartens (closer to nursery schools in the United States) were run by the Socialist Party of Austria and were therefore similar in educational philosophy.<sup>1</sup>

Although all kindergartens were the same in terms of types of play units available, they did vary in density and number of rooms. Kindergarten 1 offered 11.1 square feet per child (34 children in one room 18 × 21 ft). Kindergarten 2 had 9.8 square feet per child (25 children in two rooms—13 × 13 ft and 7 × 11 ft). Kindergarten 3 had 12.9 square feet per child (41 children in one room 22 × 24 ft). Although all three kindergartens were, in an absolute sense, crowded, the three kindergartens were representative of the range of densities available in the crowded city of Vienna.

All three kindergartens were staffed by a single teacher. In two of the kindergartens, another adult would occasionally enter the classroom to lead singing or to help with a special craft project. All observations for this study were made when the primary teacher was the only adult present. Thus the adult-child ratio during the observations was highest for Kindergarten 2 and lowest for Kindergarten 3. Kindergarten 3 lasted all day, whereas Kindergartens 1 and 2 had morning programs. All classes, however, were observed in the mornings, between 7:30 and 10 a.m.

### Procedure

All observations were made during periods of free play. Observation of a child began as he or she in-

<sup>1</sup>Initially, 28 children were observed: 4 girls and 5 boys in Kindergarten 1, 5 girls and 6 boys in Kindergarten 2, and 4 girls and 4 boys in Kindergarten 3. To alleviate difficulties in computer analysis, however, 4 subjects were eliminated by a random-selection method, yielding sex-balanced groups of 8 in each kindergarten.

TABLE 1  
Means of Child Behavior Measures as a Function of Play-Unit Type

Behavioral Measure	Play Unit		
	Simple	Complex	Super
Size of play group (3 = largest)	2.1	2.4	2.7
Degree of involvement (1 = highest involvement)	3.3	2.6	2.1
Level of positive affect (1 = most pleasure)	3.0	2.4	2.1
Length of complete activity segments (minutes)	9.5	17.1	12.9
Number of aborted segments	0.5	0.5	0.8

TABLE 2  
Means of Child Behavior Measures for Girls and Boys

Behavioral Measure	Girls	Boys
Size of play group (3 = most complex)	2.3	2.5
Degree of involvement (1 = highest involvement)	3.0	2.4
Level of positive affect (1 = most pleasure)	2.8	2.3
Length of complete activity segments (minutes)	11.9	12.3
Number of aborted segments	0.6	0.6

Play-unit type was also related to the level of positive affect exhibited by the children,  $F(2, 36) = 14.66$ ,  $p < .001$ . *T* tests for matched pairs revealed that children's affect was significantly lower at simple units than at either complex units ( $t = 2.79$ ,  $p < .01$ ) or super units ( $t = 4.14$ ,  $p < .001$ ). Table 1 presents the mean level of positive affect for each type of play unit.

Finally, play-unit type significantly affected the length of the complete activity segments,  $F(2, 36) = 5.40$ ,  $p < .02$ . The shortest segments were at simple units (Table 1). Results of matched-pair *t* tests showed only one significant difference. This difference was between mean number of minutes at simple and complex play units ( $t = 2.22$ ,  $p < .05$ ). The mean number of aborted activity segments occurring at each type of play unit is presented in Table 1. Type of play unit did not have a significant effect on number of aborted segments.

### Sex Differences

As Table 2 indicates, boys showed higher involvement levels than girls did,  $F(1, 36) = 5.31$ ,  $p < .05$ . Sex also accounts for a significant amount of variance in level of positive affect observed,  $F(1, 36) = 4.71$ ,  $p < .05$ ; boys overtly exhibited more pleasure than girls (Table 2). Table 2 also shows mean size of play group, length of complete activity segments, and number of aborted segments for girls and boys; sex did not make a significant difference for these aspects of behavior.

### Kindergartens

Each kindergarten's mean number of aborted segments per child was as follows: .92 for Kindergarten 1, .21 for Kindergarten 2, and .62 for Kindergarten 3.

The variance among the means was significant,  $F(2, 36) = 4.16$ ,  $p < .05$ . *T* tests for independent samples revealed that the significant difference in mean number of aborted play segments occurred between Kindergartens 1 and 2 ( $t = 2.13$ ,  $p < .05$ ). It is impossible to know for sure which factor or factors produced fewer aborted segments in Kindergarten 2 than in Kindergarten 1, but a possible explanation is suggested in the Discussion section.

### DISCUSSION

This study shows that complexity of play units is closely related to children's behavior. Although the methods of the two studies are not directly comparable, this pattern is in line with that of Teets (1985). In the present study, group play occurred more at the highly complex, super units, whereas solitary play was more frequent at simple units, as predicted by Prescott et al. (1972). Increasing complexity increased the involvement or concentration of the child (super > complex > simple), another result in general agreement with findings by Teets (1985). In addition, children exhibited the lowest amount of pleasurable affect at simple units. Finally, complex units encouraged the longest play activity. These results show that qualitative characteristics of the physical environment affect children's involvement in their play in Austria as well as in the United States (Kritchevsky, 1967; Teets, 1985).

This study found no significant sex differences with regard to size of play group. Thus, our results agree more with Barnes (1971) than with Prescott et al. (1973). The discrepancy may stem from the difference between indoor and outdoor space. Because our study dealt only with indoor space, boys did not have as much opportunity to engage in solitary activity as they did in the Prescott et al. (1973) study.

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