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Localization of Preschoolers' Behavior

on Four Playgrounds

Mary Rallis

University of Ottawa

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Abstract

Naturalistic observations were made on 72 preschoolers in four daycare centres to determine whether preschoolers preferred certain areas of the playground and whether specific social and cognitive behaviors were localized in particular parts of the playground. Each playground area was classified in one of four ways (enclosed/private areas, play structures, pavement, and sand) to determine whether different areas elicit different behaviors. Whether individual differences in internalizing or externalizing behaviors or sex influenced amount of time spent in different types of areas or number of areas played in were also examined. Results indicated that preschoolers spent more time on pavement and sand than on play structures and private areas and that there was more unoccupied activity in the former two areas than in the latter. Sand appeared to promote fine motor play whereas play structures promoted gross motor play. Results did not support the hypothesis that externalizing or internalizing behaviors or sex influenced the use of space.

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Play is a diverse human activity with a multiplicity of meanings (Slobin, 1973). A uniquely creative act, it can be viewed as a state falling somewhere between pure fantasy and a realistic orientation to the external world. Play often appears to be non-instrumental and intrinsically motivating (Berlyne, 1960; Bruner, 1972; Hutt, 1976). Although play may be functionally oriented with many desirable outcomes and goals (Vygotsky, 1976), the state of play is not dominated by these goals since they are self-imposed and can change at the player's whim (Piaget, 1962).

Theorists have expounded on the emotional, cognitive, and social benefits of play. In terms of children's emotional adjustment, play has been conceptualized as an important cathartic agent in the reduction of frustrating unfulfilled needs (Freud, 1961; Vygotsky, 1976), a modulator of arousal (Berlyne, 1960; Hutt, 1976), a facilitator of positive affective states (Singer, 1973), and a means of discovering the self as a separate entity from external reality (Winnicott, 1971).

Play has also been conceptualized as an important facilitator of cognitive development. Bruner (1976) discussed the role of object play in learning about properties and in improving problem solving skills. Piaget (1967a) wrote about the role of play in the development of enduring cognitive structures. Both Piaget (1967a) and Vygotsky (1976) discussed how the use of symbols in pretend play helps in the development of pure symbols necessary for language.

Theorists have also discussed the importance of social play, and more specifically sociodramatic play, for social development. Through such activity, children begin to understand various roles and learn to take the perspective of another. They also investigate and master different social-interactional processes and thus acquire social skills (Dansky & Silverman, 1975; Garvey, 1976).

In studying the phenomenon of play, psychologists have developed descriptors and norms, and identified developmental progressions in play. Parten (1932) defined six developmentally sequential social participation categories: unoccupied behavior; solitary play; onlooker behavior (child observes other children but does not participate with them in an activity); parallel play (child plays beside but not with other children); associative play (child plays and shares with other children); and cooperative play (child engages in social play in which there is a division of labour). Smilansky (1968) delineated categories of cognitive play based on Piaget's system (1962) and ordered them in terms of developmental complexity: functional play (child engages in simple repetitive muscular activities with or without objects); constructive play; fantasy play; and games with rules.

Parten's work (1932), as well as subsequent research (Rubin, Maioni, & Hornung, 1976), generally found that parallel and associative play were the most frequently occurring social participation categories during the preschool age period, whereas unoccupied play, onlooker, and cooperative play were the least

frequently occurring. Of Smilansky's cognitive play categories, constructive play has been found to be the most frequently occurring among preschoolers, followed closely by functional play; dramatic play and games with rules occur fairly infrequently (Rubin et al., 1976; Rubin, Watson, & Jambor, 1978).

The social participation and cognitive play patterns of children change over time. Associative and cooperative play increase as children grow older (Parten, 1932; Rubin et al., 1978). Functional play is at its highest level between 14 and 30 months and then declines (Hetherington, Cox, & Cox, 1979; Rubin & Krasnor, 1980; Rubin et al., 1978). Pretend play increases with age from 3 years until approximately 6 or 7 years and then begins to drop off (Hetherington et al., 1981; Rubin & Krasnor, 1980; Rubin et al., 1978). Games with rules become increasingly more evident as a child progresses through elementary school (Hetherington et al., 1979; Rubin & Krasnor, 1980; Rubin et al., 1976, 1978). Parallel-constructive, parallel dramatic, and group-dramatic play increase from preschool to elementary school (Rubin et al. 1978).

There are also sex differences in play. Preschool boys have been found to be more active (Brown & Burger, 1984; Halverson & Waldrop, 1973; Pederson, & Bell, 1970; Richer, 1979 as cited in Richer, 1984) and to engage in more rough-and-tumble play (Blurton Jones, 1967; Heaton, 1983 as cited in Humphrey & Smith, 1984; McGrew, 1972; Smith & Connolly, 1980) and aggression (Brown & Burger, 1984; Maccoby & Jacklin, 1974, 1980) both indoors and

outdoors; preschool girls are more likely to exhibit sedentary constructive play (Clark Wyon, & Richards, 1969; Henniger, 1985; Moore, Evertson, & Brophy, 1974; Rubin, 1977a, Rubin et al., 1976, 1978). In their indoor play, preschool boys have been shown to engage in more functional play (Freedman, 1971 as cited in Rubin, Fein, & Vandenberg, 1983; Rubin et al., 1976) and to be more curious and exploratory than girls (Daldry & Russell, 1982; Hutt, 1970, Rabinowitz, Moely, & Finkel, & McClinton, 1974); girls are more likely to stay in close proximity to teachers and to interact and comply more with authority (Fagot, 1978). Finally, preschool boys have been shown to cover more playground areas and space and to engage in more playground fantasy play than girls (Harper & Sanders, 1975; Henniger, 1985; Sanders & Harper, 1976).

Like preschoolers, elementary school males have been found to be more active in their indoor and outdoor play (Block, 1984; Pellegrini; 1989; Sluckin, 1981) and to engage in more rough-and-tumble play than their female counterparts (Humphreys, 1983 as cited in Humphreys & Smith, 1984; Humphreys & Smith, 1987; Maccoby & Jacklin, 1974; Pellegrini, 1989). Observed indoors, school aged boys have been shown to be more aggressive, more curious, and more exploratory in their play with objects (Block, 1984; Maccoby & Jacklin, 1974). In addition, while on the playground, school-aged boys play in larger groups, engage in more age-heterogeneous play and more fantasy play and games than girls; males' games are generally also longer lasting (Campbell &

Frost, 1985; Lever, 1976; Sluckin, 1981). Finally, the playground activities of boys in middle childhood appear to be more complex than those of similarly-aged girls in terms of specialization of roles, interdependence of players, group goals, size of group membership, number of rules, and number of team divisions (Lever, 1976, 1978; Wardrop & Halverson, 1975). Females have been found to engage in more onlooking behavior (Sluckin, 1981).

In summary, play has been studied extensively as an important facilitator in emotional, cognitive, and social development. Developmental descriptors, norms, and progressions have been delineated by research. Sex differences in play have also been reported.

The Importance of the Physical Environment for Play

A substantial body of research provides empirical evidence for the influence of the physical environment on play behavior. The type and amount of play materials, the arrangement of space, and the amount of space available have all been found to affect play. According to the classic behavioral model (Watson, 1913; Hull, 1943; Spence, 1948), the environment, as a complex set of stimuli, controls which behaviors will occur. Wachs (1986) has argued that the simplest model of environmental effects is the "global" model of the environment, in which the environment is said to affect all individuals in the same way.

There is some support for the global model in research on children's play. Quiltch and Risley (1973) found that social play occurred more frequently with social toys (e.g. checkers/playing cards) than with non-social toys (e.g. gyroscope/puzzles). Dolls and houses and cars and/or vehicles encourage social play, whereas nonsocial play (i.e., solitary and parallel) is more likely to take place in the presence of construction materials such as playdough, plasticine, sand, water, puzzles, paints, crayons, and scissors (Green, 1933; Hendrickson, Strain, Tremblay, & Shores, 1981; Parten, 1933; Rubin, 1977a; Rubin, 1977b; Shapiro, 1975; Shure, 1963; Van Alstyne, 1932).

Play materials influence not only social interaction but also the type of cognitive play engaged in. Playdough, plasticine, sand, and water have been associated with sensorimotor play, whereas paints, crayons, and scissors have been shown to encourage constructive play (Rubin, 1977a; Rubin, 1977b; Shure, 1963). Dramatic play increases in the presence of vehicles, house-related materials, and high-structured objects (e.g., tea sets) more than with low-structured objects (e.g., pipe cleaners, boxes) (McLoyd, 1983; Rubin, 1977a; Rubin, 1977b; Shure, 1963).

Play behavior has been shown to be influenced not only by type of play materials available but also by amount of materials. In a study by Smith and Connolly (1973), provision of more play equipment resulted in increased rates of solitary play and decreased rates of rough-and-tumble play. Researchers studying

the play of infants (Eckerman & Whatley, 1977) and toddlers (Bjorkund, 1979 as cited in Rubin & Howe, 1985) have found a similar relationship between amount of play equipment and level of social interaction.

Other aspects of the physical environment, namely the division and arrangement of space, have also been shown to influence behavior. The studies of Hill (1974) and Sheehan and Day (1975) both showed that noisy boisterous activities occurred in large open classrooms, whereas quieter interactions occurred in classrooms arranged into smaller play areas. Pollowy (1974) found that providing clear paths and increasing the ease with which children could visually identify learning areas increased child-equipment interactions.

Finally, studies of the amount of available space, although not totally consistent in their findings, suggest that social density influences play behavior. Some investigations have found that rates of interaction, including that for aggression, increase as social density increases (Hutt & Vaisey, 1966; Loo & Kennelly, 1979; Smith, & Connolly, 1973). Other studies, however, have found lower rates of social interaction and aggression in high social density situations (Loo, 1972; McGrew, 1970; Prieser, 1972). Prescott (1981) writes that "density appears to be entangled with amount of playground equipment, the shape and organization of the play areas, and the way adults have conceptualized spatial use for groups of varying sizes " (pp.

132). Perhaps contradictory findings in this area of research are a function of differences across studies on these variables.

The Importance of the Playground

The present research was concerned with one feature of the physical environment, namely the playground, and how it influences children's play. Despite the daily use of the playground by preschool and elementary school aged children for an hour or more a day, rigorous empirical studies of this outdoor environment are limited. Research that has been done can be divided into two classes: the first in which preferences for different types of playgrounds and for different features of the playground have been explored, and the second in which influences of the playground environment on behavior have been examined.

Investigations of the behavioral effects of the playground environment can be organized into four types. The first type of research has compared behavior on the playground with behavior in indoor play environments. The second type has compared the behavioral effects of different types of playgrounds classified under general categories such as traditional, contemporary or adventure. The third type has looked at the behavioral influences of different parts of the playground. The fourth type has compared the behavioral influences of playgrounds which differ on a specific variable such as the number of enclosed areas they provide.

Playground Preferences. In studying children's preferences in the playground, investigators have examined both usage patterns and expressed preferences. Observations of frequency of use, drawings of children's favorite places, and interviews or questionnaires in which children are asked to make preferred choices have all been used. These studies suggest a preference for more contemporary types of playgrounds over traditional playgrounds (Frost & Campbell, 1985; Gabbard & Leblanc, 1980; Myers, 1985; Strickland, 1979/1980; Van Valkenberg, 1978). Traditional playgrounds usually contain metal equipment in the form of swings, slides, seesaws, and climbing bars, whereas more contemporary types are not as easily described by equipment names, but often contain multifunctional structures with, at times, loose parts, and emphasize novel textures, shapes, and heights.

Expressed preferences and usage patterns for particular types of playground equipment are high for moveable objects, those allowing low non-effort movement such as swinging and sliding, and multifunctional, complex equipment (Callecod, 1974 as cited by Brown & Burger, 1984; Frost & Campbell, 1977; Frost & Strickland, 1985; Gramza, Corush, & Ellis, 1971; Heusser, Adelson, & Ross, 1986; Hole, 1966; Naylor, 1985; Peterson, Bishop, & Michael, 1973; Sanoff, 1986). Hard surfaces made of such materials as asphalt are used more frequently than other areas containing grass, sand, or equipment (Beth-Halachmy, 1978; Heusser, 1986; Ledingham & Chappus, 1985). Moore (1986),

however, found that children preferred natural elements such as dirt, trees, plants, and water, with the latter being especially popular.

One problem with preference-oriented research is that it has been almost entirely descriptive, without statistical analyses or the testing of specific hypotheses. Comparisons across studies are made almost impossible by the fact the definitions of types of playgrounds vary across studies. Moreover, the pre-school child's preferences have been generally ignored.

Behavior on the Playground Versus Indoors. There is very little research that compares indoor and outdoor play behavior. Henniger (1985) found that preschoolers engaged in significantly more parallel play outdoors than indoors and in significantly more constructive play when they were indoors. Using third and fifth grade children, Dodge, Coie, and Brakke (1982) found that solitary play was more frequently observed in the classroom than on the playground, whereas interactive behavior, including aggression, was more frequently observed outdoors.

Comparisons of data from outdoor studies with that from indoor studies suggest further differences between the two settings. In Hart and Sheehan's (1986) playground study of preschoolers, nonplay (defined as the combination of unoccupied and onlooker play) was observed more frequently and constructive play more infrequently than in the indoor studies of Parten

(1932) and Rubin (1978). Unoccupied play occurred more frequently and parallel play occurred more infrequently in an outdoor study of kindergarten and grade one children (Hertz-Lazarowitz, Feitelson, & Zahavi, 1981) than in an indoor study of kindergartners (Rubin et al, 1976). However, it is important to note that these behavioral differences may have been a result of differences in the subjects employed in the various studies rather than a result of indoor-outdoor differences.

Behavior on Different Types of Playgrounds. In a study by Brown and Burger (1984), six playgrounds were rated in terms of the extent to which they met general criteria hypothesized to have positive consequences for children's play. These criteria, based on the design suggestions of architects and educators (Hill, 1978; Moore & Cohen, 1978 as cited in Brown & Burger, 1984;; Rohane, 1981), involved providing opportunities for the following: privacy; observation of ongoing events; promotion of success experiences; activities which allow children to recreate representations of experiences; activities involving exploration, experimentation, and problem solving; and finally activities involving a variety of locomotor movements. Data from naturalistic observations suggested that playgrounds that met fewer of the guidelines did not elicit fewer educationally desirable social, language, or motor behaviors than playgrounds that reflected these criteria to a greater degree. However, the

design of this study made it virtually impossible to test the usefulness of each separate criterion.

Other studies using a general classification system to compare different types of playgrounds suggest that traditional playgrounds may promote less complex forms of play than either contemporary or adventure playgrounds. In a study by Hayward, Rothenberg, and Beasley (1974)), naturalistic observations in neighbourhood playgrounds suggested that children's play on a traditional and on a contemporary playground was mainly parallel and physical in nature. At an adventure playground, play predominantly involved talking, listening to music, and arts and crafts. Hayward et al. (1974) concluded that the traditional and contemporary playgrounds promoted a limited range of possible behaviors, whereas the adventure playground promoted not only more behaviors but more complex types of social play. However, one must be aware of a probable selection bias when interpreting these results. Children at the traditional and contemporary playgrounds were mainly of preschool age, whereas children at the adventure playground were school-aged or in their early teens. Children differing not only in age, but also in behavior, may have chosen different playgrounds and the effects of these possible differences in selection on results were not discussed. Therefore, differences in the complexity and type of behaviors exhibited on each type of playground may have reflected the influence not only of playground features but also of the age and type of children playing in each playground.

By observing the same sample on different playgrounds and having subjects serve as their own experimental controls, researchers have resolved the problem of confounding population and playground type and have been able to draw clearer inferences about the effects of playgrounds on behavior (Campbell & Frost, 1985; Hart & Sheehan, 1986; Strickland, 1979; Wolfe, 1979). Campbell and Frost (1985) found that, for grade two children who alternated play sessions between a traditional and a contemporary playground, higher levels of associative play occurred on the contemporary playground whereas more parallel play (less interactive play) occurred on the traditional playground. Both types of playgrounds elicited complex forms of cognitive play. However, the traditional playground produced significantly more games with rules than the contemporary playground, whereas the contemporary produced significantly more dramatic and constructive play than the traditional playground. Strickland (1973) also observed a group of grade three children on two different playgrounds. The results were similar to those of Campbell and Frost (1985): both social and cognitive play were more complex on the contemporary than on the traditional playground.

Wolfe (1979) took preschoolers with visual handicaps to both a contemporary and an adventure playground. The amount of social play was much higher on the adventure playground than on the contemporary playground. Hart and Sheehan (1986) found that preschoolers engaged in more passive physical activity (sitting,

standing, or walking) and less active physical activity (climbing) on a contemporary playground than on an adventure playground. However, rates of verbal interaction and level of social and cognitive play varied little across the two playgrounds.

Comparative studies of different types of playgrounds need to be interpreted cautiously. It is difficult to compare different studies which vary in their definitions of what constitutes a traditional, contemporary, or adventure playground. Moreover, Pellegrini (1987) has argued that differences in children's observed behavior may be due as much to within-playground variation as to between-playground variation, and this hypothesis has received little attention. Thus, playgrounds with different subcomponents may elicit very different types of behavior.

Localization of Behavior on the Playground. Several investigators have made efforts at examination of localization of behavior within the playground using primarily descriptive rather than statistical methods (Beth-Halachmy & Thayer, 1978; Cooper Marcus, 1974; Ledingham & Chappus, 1986; Naylor, 1985; Pellegrini, 1989; Swedish Council for Children's Play, cited in Noren-Bjorn, 1982). However, with the exception of the studies by Ledingham and Chappus (1986) and Pellegrini (1989), the coding procedures used have not involved clear, operationally defined categories.

Both Naylor (1985) and the Swedish Council for Children's Play (cited in Noren-Bjorn, 1982) observed children in several neighbourhood parks to see what they did on various playground structures. In both these studies, the primary physical activity that took place on the different pieces of equipment was noted. Naylor (1985) found that talking occurred most frequently on a set of swings and that both physical play and social interaction took place on a fort and a tire slide. The Swedish Council for Children's Play (cited in Noren-Bjorn, 1982) observed that small and large combinations of equipment promoted movement in combination with games and sensory experience, while static representational equipment (i.e. boats, sculptures), playhouses, wind and rain shelter areas, and sand boxes promoted constructive and/or fantasy play.

Beth-Halachmy and Thayer (1978) and Cooper Marcus (1974) have described children's behavior in open areas of the playground (asphalt, grass, sand). On hard surfaces, bicycling, roller skating, manoeuvring tricycles or toy cars, skipping, playing hopscotch, and engaging in games requiring that a ball be bounced were all observed. Activities on grass included sitting, talking, watching, playing baseball, and roughhousing. Sensorimotor, constructive, and fantasy play were all observed in sand areas.

A study by Ledingham and Chappus (1986) represented a more methodologically rigorous approach to the question of what behaviors occurred most frequently in which areas.. Using a well-

described observational procedure, these investigators coded not only what behavior occurred but also in what five foot square area of the playground it took place. The highest concentration of gross motor play and simple stereotyped behaviors occurred on a play structure. Cooperation was highly localized in open areas of the playground and on a tire swing. Rough and tumble play and games played alone were also more likely to occur in open areas than on the play structure.

A study by Pellegrini (1989) is distinguishable from other research in its use of both operationally-defined categories and statistical analysis of data. Significantly more rough-and-tumble play was found to occur on soft, grassy areas and on a play structure than on asphalt. The low occurrence of aggression probably was responsible for the absence of localization for this behavior.

In summary, descriptive studies suggest that different parts of the playground promote different play behaviors. Play structures encourage motor play whereas open areas (asphalt, grass, sand) stimulate more cognitively advanced forms of play. More specifically, games occur on asphalt and grass; rough-and-tumble play occurs on grass; constructive and fantasy play occurs on grass.

Behavior as a Function of Specific Features of the Playground. There have been a number of investigations of the playground in which the independent variable of interest has been

more specifically defined (Allred, 1976; Bruya, 1985; Johnson, 1935; Kruidener, 1978 as cited Brown & Burger, 1984; Pinciotti & Weinstein, 1986). Kruidenier (1978, as cited by Brown & Burger, 1984) categorized playground environments according to the number of enclosed areas they provided. Enclosed areas could be entered and provided small areas of separate space. Naturalistic observations indicated that playgrounds with more encapsulated areas had higher frequencies of pretend play. However, in this study it is also possible that differences in samples across different playgrounds may have influenced results.

Allred (1976) examined the effects of four different exterior play equipment areas (single, dual, complex, or no equipment) on preschoolers' play in small groups. By observing the same subjects in each of the four areas, she avoided problems associated with population differences across areas. The complex play equipment area encouraged more positive social interaction and elicited more contact with equipment than did the other three areas. Single and dual equipment areas encouraged little social involvement. Although the no equipment play area did encourage high rates of social involvement, it was frequently of an aggressive nature.

Two other investigations (Johnson, 1935; Pinciotti & Weinstein, 1986) have examined the playground environment in terms of amount of equipment available. In these studies, however, the amount of equipment in outdoor settings was experimentally altered. Johnson (1935) found that preschoolers'

motor play, play with materials, and aggressive behavior increased, and the amount of positive social play decreased, as the amount of traditional playground equipment was increased. Along the same lines, Pinciotti and Weinstein (1986) found that, when a tire play structure was added to an empty asphalt schoolyard at an elementary school, the amount of active physical play increased. After the instalment of a play structure, there was significantly more pretend play, significantly fewer organized games, less uninvolved behavior, and less roughhousing.

Bruya (1985) also experimentally altered a playground, looking at the same contemporary playground arranged in two different ways; in a traditional format in which structures were separate, and in a contemporary format in which structures were unified or linked. Although preschoolers' motor patterns did not appear to change from one arrangement to the other, there was an increase in the amount of peer contact and a decrease in the amount of adult contact in the unified format.

In short, number of play structures and enclosed areas, complexity of structures, and unification of structures all appear important for predicting behavior. Decreasing the amount of equipment and providing more complex play structures that are unified rather than separately arranged appear to increase social interaction. Increasing number of encapsulated areas appears to elevate the frequency of fantasy play.

Classification of Playground Environments

Playground research has used different systems to classify the playground environment. Broad classification systems such as traditional versus contemporary, amount of equipment, and degree of encapsulation have all been suggested. Efforts to classify the playground in terms of its parts have generally been rudimentary. Although Ledingham and Chappus's (1986) division of the playground into five foot square areas was comprehensive, it is not always manageable to use such a system in a playground setting, and several different structures can occupy the same area. Playground research does however suggest that several distinctions between parts of the playground are important for determining environmental effects. A primary distinction can be made between equipment and open space. Ledingham and Chappus study (1986) suggest that these two types of areas elicit different behaviors in elementary school aged children, with equipment producing motor play and open areas producing more complex, cooperation, rough-and-tumble play, and games played alone.

A secondary division involves dividing the play structure into enclosed versus non-enclosed components. This approach appears useful for a number of reasons. First, common sense suggests that enclosed areas should produce lower mobility than other components of the play structure. Thus, enclosed areas would not be expected to stimulate motor play as does the play structure as a whole (Ledingham & Chappus, 1986). Second,

anecdotal data from the Swedish Council on Play (cited in Noren-Bjorn, 1982) coupled with the empirical data of Kruidener (1979, as cited by Brown & Burger, 1984), suggest that encapsulated areas promote fantasy play. Other than research which looks at the effects of small cubicles on the learning behavior of school aged children (Cruse, 1961; Gorton, 1972; Rost & Charles; 1967; Shores & Haubrich, 1969), no other research has examined the effects of small private areas. Thus, there appears to be a need to examine empirically what children do in small enclosed areas of the play structure in comparison to what they do on other parts of the play structure.

Open space can be divided into different forms. One form is pavement or asphalt. Its hardness renders it a distinct form of open space. Descriptive studies (Beth-Halachmy & Thayer, 1978; Cooper Marcus, 1974) suggest that this form of open space encourages play requiring a hard surface (i.e. ball games, bicycling). Another form of open space is grass. Studies suggest that sitting, talking, watching, and rough-and-tumble play occur more often on grass (Beth-Halachmy & Thayer, 1978; Cooper Marcus, 1974; Pellegrini, 1987). A final form of open space is sand. This soft form is one of the few materials on the playground which can be manipulated. Piaget (1962) has noted the need for children to manipulate real materials in order to develop knowledge of the physical properties of objects, and anecdotal data (Cooper Marcus, 1974; Swedish Council On Children's Play, 1982) on outdoor play in sand suggest its usefulness for

sensorimotor, constructive, and fantasy play. Studies of sand in the indoor preschool environment also suggest that this play material produces more solitary play, parallel play, and functional activity (Hendrickson et al., 1981; Johnson & Erschler, 1981; Parten, 1933; Rubin, 1977a, 1977b).

Mediational Models of Environmental Effects

In examining the relationship between the playground and behavior, this study will go beyond the traditional "global" model of environment which postulates that the environment affects development similarly for all kinds of children at all ages (Wachs, 1986). In the present study, a theory emphasizing environmental influences mediated by individual differences will be adopted to examine the influence of playground structure on children's behavior. It is proposed that personal characteristics, whether they be genetically or environmentally determined, interact with environmental features to create behavior. In other words, different individuals may not only respond to the same environment in different ways but may also seek out different environments and in so doing may change the nature and extent of environmental influences on them.

Post-Watsonian psychologists were the first to offer opposition to a rigid deterministic view of the environment and to delineate "mediational" models (Bandura, 1969; Tolman, 1951) These theorists argued that the relationship between a stimulus

and a response could not be predicted accurately without reference to intervening cognitive processes. Mental processes determined which environments individuals would construe as potentially reinforcing, and thus mediated the impact of the environment on behavior. Other theorists in areas of social and perceptual psychology (Lewin, 1954; Brunswick, 1949) have also emphasized the importance of the subjective or perceived environment as a determinant of behavior.

Environmentalists and behavioral-geneticists have also proposed mediational models of environmental effects but they do not necessarily require that cognitive appraisals by the individual mediate environmental effects. Wachs and Gruen (1982) argue that different organisms respond differently to similar environmental circumstances (i.e., organismic specificity). Thus, the impact of the environment on development is mediated by the characteristics of the individual on whom the environment impinges. Plomin, DeFries, and Loehlin (1977) discuss the nonuniform reaction of different genotypes to the environment (i.e., gene-environment interaction). The difference between organismic specificity and gene-environment interaction is that with the former individual characteristics mediating environmental effects do not necessarily have to be genetic in origin.

Plomin et al. (1977) propose three types of genotype-environment associations to describe how genetic propensities may determine which environments individuals will experience and in

turn be affected by. Passive genotype-environment associations may occur because children share heredity with members of their family and can thus passively inherit environments correlated with their genetic predispositions. Evocative genotype-environment associations are experiences of the child that derive from reactions of other people to the child's genetic propensities. Active genotype-environment associations occur when children actively select or even create environments that are correlated with their genetic propensities. This has been dubbed "niche building" or "niche picking".

Scarr and McCartney (1983) have discussed the three kinds of genotype-environment interaction proposed by Plomin et al. (1977) in a developmental framework. They argue that the influence of the passive genotype-environment association declines from infancy to adolescence and that the importance of the active genotype-environment association increases over this same time period. As they develop, children can extend their own experiences beyond their family's influence and, by seeking out environments that they find compatible and stimulating, can have a more direct role in determining the nature of environmental effects.

Research and Individual Differences in Environmental Effects

Research clearly provides support for a mediational model of environmental effects. Sex, age, and social competence have all been found to influence which environments individuals will

select to experience. On elementary school playgrounds, boys play further away from the school and prefer asphalt and "loose parts" more than girls; girls play closer to the school and are more equipment-oriented (Beth-Halachmy, 1978; Hole, 1966; Lever, 1976; Moore, 1986; Myers, 1985). This sex difference is probably related to the greater popularity of competitive and/or team sports among school-aged boys (Lever, 1978; Sluckin, 1981). When it comes to particular equipment choices, school-aged boys prefer large-scale, complex, multifunctional equipment over the more simpler, traditional equipment preferred by girls (Moore, 1986; Moore & Wochiler, 1974). Girls play on bars more often than boys (Moore, 1986; Myers, 1985). Finally, at least among preschoolers and kindergartners, males have been found to prefer the outdoor environment over the indoor, to play in more playground areas, and to cover more space than females (Harper & Sanders, 1985; Mulhauser, 1972).

Children show some variation in where they play on the playground as a function of age. Frost & Strickland (1985) found that kindergarten children chose equipment designed for dramatic play purposes more often than did first- or second-grade students. Heusser et al. (1986) reported that lower primary students were more interested in equipment than were upper primary students. Preschool-aged children preferred smaller scale items in comparison to school-aged children (Naylor, 1985) and preferred traditional or contemporary playgrounds over

adventure playgrounds consisting of loose play materials (Hayward, Rothenberg, and Beasley, 1974).

In addition to age and sex, social competence appears to be a potent personal characteristic affecting children's play area choices. Ledingham and Chappus (1986) found that average children and the most likeable children played in many different areas of the playground and that, at least for the more likeable children, these areas were those in which cooperative play was most likely to take place. In contrast, aggressive-disruptive children and withdrawn children had sharply delimited play areas, the former concentrating their play in areas of highest social density and the latter generally avoiding these areas. These researchers suggested that more socially skilled children may modulate their activity level by moving between areas differing in social density, whereas more deviant children may become over- or under-aroused by remaining in areas with very high or very low levels of stimulation. LaFreniere and Sroufe (1985) have reported anecdotal data which also suggests a relationship between arousal level, social participation, and the quality of social relationships. Securely attached preschoolers occasionally withdrew from highly stimulating large-group free play to play quietly with one or two peers. In contrast, anxiously attached children tended to stay in, but also become highly aroused in large group play and were more readily overwhelmed by the activity.

Three other studies bear on the relationship between social competence and choice of particular play environments. Jennings (1975) assessed preschoolers' social knowledge and ability to organize and classify physical material. He found that children who performed better on tests of the ability to organize and classify physical materials spent relatively more time in play with objects than in social play. However, children who performed better on tests of social knowledge engaged in social play as frequently as play with objects.

Vandenberg (1985) assessed social egocentrism and ability on Piagetian tasks of free sorting, some-all, and class inclusion in preschoolers. The children were then observed in "big muscle" and "fine motor" rooms. Children who were more cognitively mature and less socially egocentric were more likely to spend time in the "big muscle" room, the environment which had higher rates of social interaction and larger play groups.

Legendre and Fontaine (1989) examined rates of social interaction and use of space. Preschoolers were observed in an area where furniture layout either created obstacles forming major visual and physical boundaries (closed arrangement) or created limited boundaries (zoned arrangement). In the former arrangement, furniture obstructed eye contact between preschoolers in distant areas and teachers, whereas in the latter arrangement there was no such limitation. In contrast to their more socially active peers, withdrawn preschoolers spent much less time in distant areas in the closed arrangement than in the

open arrangement. According to Legendre and LaFontaine, the presence of a major visual boundary within the play space induced greater adult dependence on the part of the withdrawn preschooler and revealed an inability of such children to adapt to environmental constraints. The fact that withdrawn preschoolers appear to rely on teachers to solve their interpersonal problems (Rubin, 1982a, Rubin, Daniels-Beirness, & Bream, 1984; Rubin & Krasnor, 1986) may explain why they wanted to remain close to adults.

Limitations of Playground Research

Playground research has clearly outlined school aged children's preferences. It has also examined the effects of different types of playgrounds and suggested that children's play may be more complex in contemporary than in traditional playgrounds and more complex in adventure than in contemporary playgrounds. Several studies have begun to localize behavior to specific parts of the playground and to specify the important features of the playground. Number of structures, the complexity of structures, number of enclosed areas, and amount of open space appear to be important dimensions for predicting what behavior will occur.

In spite of this, there is relatively little information on preschoolers and little formal testing of hypotheses. There is also more information needed on the influence of different playground components. Although research suggests that adventure

playgrounds with little fixed equipment are educationally valuable, the trend towards fixed playgrounds is still very strong. For financial and safety reasons, playground designers and parents are not interested in building adventure playgrounds. Thus, it is necessary to assess more comprehensively the importance for play of fixed playground equipment.

The Present Study

The present study was designed to determine whether specific preschool play behaviors were localized in specific parts of the playground. A classification system was created to divide the playground into several distinct areas of study (enclosed/private areas, play structures, pavement, sand) which literature suggested were important for determining environmental effects. An observational scheme was chosen to reflect both cognitive and social aspects of the preschoolers' play behaviors. Four playgrounds were studied, allowing for an assessment of the replicability of results across playgrounds.

Since individual differences in motivational, personality, and intellectual factors may lead to different children choosing different environments to play in, the present study also examined how three salient characteristics of individuals (internalizing behaviors, externalizing behaviors, and sex) were related to choice of play areas. In this respect, the unit of study was not the whole sample but the individual ~~child~~ child and where he or she preferred to play.

Internalizing behaviors referred here to social withdrawal, disinterest in peers and activities, lack of assertiveness, and an inability to engage the participation of peers. It was expected that children scoring high on internalizing behaviors would spend more time in areas where there were fewer peers (i.e., lower social density areas) relative to areas where more peers could be found (i.e., moderate and high density areas).

It was also expected that children scoring high on internalizing behaviors would be less likely to seek out new experiences and thus, would spend more time in a few play areas. In fact, withdrawn preschoolers have been shown to engage in less transitional behavior than nonwithdrawn preschoolers (Rubin & Clark, 1983), spending less time moving from one activity to another, and thus presumably covering fewer playground areas.

Externalizing behaviors referred here to verbal and physical aggression as well as to noncompliance and disruptiveness. It was expected that preschoolers scoring high on externalizing behaviors would spend more time than nonexternalizers in socially dense areas and cover fewer playground areas. Aggression in preschoolers correlates with frequency of group play (Cummings, Hollenbeck, Iannotti, Radke-Yarrow, & Zahn-Waxler, 1986; Rubin & Clark, 1984; Stein, Friedrichs, & Vondracek, 1972), and thus externalizers were expected to be found in areas where peers were plentiful.

Because preschool males have been found to exhibit more functional, motor, and rough-and-tumble play than females, who

are more likely to exhibit more sedentary-constructive play (Brown & Burger, 1984; Halverson & Haldrop, 1973; Henniger, 1985; Pederson & Bell, 1970; Pellegrini, 1989; Rubin, 1977a; Rubin et. al, 1976, 1978), it was expected that each sex would be drawn to areas that matched their play styles. More specifically, preschool males' greater motor activity was expected to take them to areas further away from the preschool building, whereas it was expected that the sedentary behavior of preschool females would keep them closer to the school.

Preschool males have also been found to be more curious and to engage in more exploratory behaviors than their female counterparts (Daldry & Russell, 1982; Hutt, 1978; Rabinowitz, Moely, Finkel, & McClinton, 1974). Such behavior was expected to take boys to more parts of the playground. On the other hand, preschool females have been found to stay in close proximity to teachers (Fagot, 1978) and thus would not be expected to cover as many areas. The fact that preschool males have also been shown to prefer the outdoor environment more than females (Harper & Sanders, 1975) may also partially explain why boys' curiosity and exploratory behavior should be greater outside.

In summary the following four hypotheses were made with respect to individual differences in use of play space:

- 1) Preschoolers scoring high on internalizing behaviors should spend more time in a few areas of the playground, concentrating their play in areas of low social density more

than preschoolers scoring average or low on internalizing behaviors.

- 2) Preschoolers scoring higher on externalizing behaviors should spend more time in a few areas of the playground, concentrating their play in areas of high social density more than preschoolers scoring average or low.
- 3) Preschool males should play in areas further from the preschool, whereas preschool females should play in areas closer to the preschool.
- 4) Preschool males should play in more areas of the playground than preschool females.

Method

Subjects

Seventy-two children between the ages of 35 and 56 months participated in the study. There were 28 preschoolers from Daycare 1 (14 males and 14 females) with a mean age of 46.4 months, 18 preschoolers from Daycare 2 (9 males and 9 females) with a mean age of 46.5 months, 13 subjects from Daycare 3 (8 males and 5 females) with a mean age of 44.8 months and 13 subjects from Daycare 4 (9 males and 4 females) with a mean age of 42.1 months. To determine whether ages differed across the preschools, a one-way ANOVA was conducted, but showed no significant differences.

Parents of children in the senior group at Daycare 1 and in the preschool groups in Daycares 2 to 4 had been given a letter providing details of the general nature of the study and a consent form (see Appendix A). In total, 88 letters and consent forms were distributed. Across the four daycares, 98% of parents gave consent for their children to participate in the study. Two parents at Daycare 1 and one at Daycare 2 refused consent. Before the study was under way, four children from Daycare 1, one from Daycare 2, and one from Daycare 4 left the centre. Three children from Daycare 1, two from Daycare 2, one from Daycare 3, and one from Daycare 4 were dropped from the study because their high rate of absence meant that less than 30 minutes of observational data could be obtained for them.

Description of Daycare Settings

Four daycare centres were selected which served similar populations and had similar educational objectives, programming, and degree of parental involvement. In all four daycares, 95 to 100 % of the children enrolled had their day care costs subsidized by the provincial government. Given that the criteria for subsidy in Ontario are based not only on a family's income level, but also on its expenses relative to assets, one cannot conclude that only a population of lower socioeconomic status was being served by the daycare centres. Nevertheless, it is safe to say that the daycares served children who were of lower to middle socioeconomic status.

All four daycare centres aimed to meet the needs of the whole child, incorporating physical, emotional, social, and cognitive goals into the curriculum. Program schedules were extremely similar across daycares and included a total of two to two-and-a-half hours of outdoor play both in the morning and in the afternoon. In all four daycare centres, parents had direct input in the programming and running of the organization.

Daycare 1, the largest daycare in terms of enrolment, served three different groups of children. The junior group consisted of twenty two-year old children. The senior group consisted of 37 children, who were between 35 months and five years of age. There was also a group of 30 kindergarten children aged five and over who were present before and after school hours. The maximum number of children present on the playground at any one time was

57 (for one-third of the outdoor play). However, during most outdoor play, part of the senior group was outside with all of the junior group, for a maximum of 43 children.

Daycare 2 served two different groups of children. There were 14 toddlers aged from one-and-a-half to just under three years of age, and 21 preschoolers who were three or four years of age. During most of the outdoor play, toddler and preschool groups played separately on the playground.

Daycare 3 had an infant group, a toddler group, and a preschool group. There were 10 infants, all under the age of eighteen months, 13 toddlers from eighteen months to two and half years of age, and 15 preschoolers all older than two-and-a-half years but younger than five. During half of the outdoor play periods, preschoolers were outside on the playground alone; for the remainder of the time, the toddler group also occupied the playground.

Daycare 4 had the same three types of groups as Daycare 3 with the same age divisions. There were seven infants, 12 toddlers, and 15 preschoolers. At this daycare centre, there were two separate playgrounds for infants or toddlers and for preschoolers so that the preschoolers were never observed in company with any other group.

Description of Playgrounds

The playgrounds of the four daycare centres can be described in terms of their total size, the amount of open space available

relative to fixed play structures, and the number and type of play structures and private areas. Layouts of the playgrounds can be found in Appendix B.

There was considerable variation in size of playgrounds across the four daycares: Playground 1 had 8,223 square feet, Playground 2, 2,229 square feet, Playground 3, 3,831 square feet, and Playground 4, 2,195 square feet.

Since the number of children present on each of the playgrounds varied at different times of the day on every playground except Playground 4, a range of available square feet per child was calculated by dividing the square footage of each playground by the minimum and maximum number of children that could be present on the playground during observations.

Playground 1 had a minimum of 144 and a maximum of 191 square feet per child. At Playground 2, the minimum square feet per child was 66 and the maximum was 110. Playground 3 had 137 to 255 square feet per child available. Playground 4, which was used solely by preschoolers, had 146 square feet per child.

Approximately 90% of Playgrounds 1, 2, and 4 was open (not occupied by equipment), whereas approximately 95% of the space was open in Playground 3. In Playgrounds 1, 2, and 3, open space took the form of asphalt, sand, and grass. In Playground 4, there was asphalt and sand but no grass. Loose pieces of equipment, such as vehicles and sand toys, could be found in the open space of all four daycares.

A distinction was made between private, enclosed areas in play structures' components and all remaining components. For the purposes of this study, private areas were defined as constructed spaces which allowed for a minimum of two children and a maximum of eight children within their boundaries. For an area to be defined as private, its boundaries had to provide for some degree of enclosure (i.e., at least three of the area's sides had to be partially walled).

Playground 1 had three permanent play structures. The largest, constructed of wood and surrounded by sand, consisted of platforms, climbing apparatuses, a firepole, a built-in bench, and areas underneath for play. A much smaller wooden structure was comprised of a slide with a large platform and a private partially enclosed area underneath the structure. A third play structure consisted of a set of traditional metal swings. Aside from these three play structures, there was also a fixed low-standing table in the sand box, a picnic table in one of the open grassy areas, two adult-sized benches on the asphalt, and a shed for storage near the entrance to the daycare.

Playground 2 contained a large wooden play structure surrounded by sand for safety purposes. This structure consisted of climbing apparatuses, a platform, a slide, a tire swing, a set of traditional swings, and a private enclosed interior area. Apart from this large structure, the open grassy area contained a picnic table, a short fixed balance beam, and five fixed logs. A small shed used for storage was located in the open asphalt area.

Playground 3 contained three permanent play structures. Two of these were private, well-enclosed house-like structures with entrances, lookout points, and benches in their interiors. The third was a large wooden structure surrounded by sand and consisting of climbing apparatuses, a platform, a slide, a firepole, a beam, a private enclosed interior space, and areas underneath. In addition to these three play structures, Playground 3 had a low-standing table and a rubber pool in the sand area, and an adult-sized bench positioned on the asphalt.

Playground 4 contained a large wooden structure surrounded by sand. This structure contained climbing apparatuses, platforms, a slide, a private house-like component with benches and a table, and areas underneath. Near the entrance to the school, there was a small shed used for storage purposes.

In summary, all four playgrounds contained multifunctional play equipment with similar types of components and private areas. Playground 2 was exceptional in having a short balance beam, and Playground 3 had three private areas as opposed to only one in each of the other playgrounds. Playgrounds 3 and 4 both had bars and their private areas were house-like components, which in Playground 3 existed as separate play structures. Playgrounds 2 and 4 both had tire swings. Only Playground 2 had no firepole. Playground 3 was the only setting to have no swing.

Measures

Kohn Social Competence Scale. The Kohn Social Competence Scale, or KSCS (Kohn & Rosman, 1972), an instrument employing teachers as raters, was used in this study to measure externalizing and internalizing behaviors. With this instrument, both adaptive and problem behaviors covering child-child, child-teacher, and child-activity situations are tapped by 73 items using a 7 point scale of ratings (from "always" to "never"). Approximately 20 minutes are needed to complete each child's appraisal.

Items are summed to yield two bipolar factor scores which Kohn and Rosman (1972) have labelled Interest-Participation versus Apathy-Withdrawal (Factor 1) and Cooperation-Compliance versus Anger-Defiance (Factor 2). For the purposes of this study, Factor 1 will be referred to as IP-AW and Factor 2 as CC-AD. A copy of the KSCS can be found in Appendix C.

A child with a high IP-AW score is characterized by interest in peers and activities, assertiveness, and ability to engage other children, whereas a child with a low IP-AW score shows withdrawal from opportunities and peers, lack of interest, nonassertiveness, and a failure to elicit the interest of other children (Kohn & Rosman, 1972). It is important to note that one pole of this scale measures social competence and popularity whereas the other implies either rejection or neglect by the peer group or a lack of action by the subject. Examples of items for

the IP-AW factor are as follows: child shows enthusiasm for work or play; child is fearful in approaching other children; child has difficulty defending his own rights with other children; child succeeds in getting others interested in what he is doing.

A child scoring high on the CC-AD measure complies with teachers requests and rules and behaves cooperatively, whereas a child with a low CC-AD score shows aggressiveness, defiance, and creates disturbances with teachers and peers which upset the normal routines (Kohn & Rosman, 1972). Examples of items for this factor are: child easily makes the change from one activity to another; child is open to ideas and suggestions of other children; child is hostile or aggression with other children, for instance, pushes, taunts, bullies,; child prevents other child from carrying out routines.

Quay (1986) found that the two most frequently noted dimensions emerging from factor analytic studies of children's behavior were those labelled as "Anxiety-Withdrawal-Dysphoria" and as "Undersocialized Aggressive Conduct Disorder". The former factor consisted of internalizing behaviors such as anxiety, fearfulness, shyness, social withdrawal, self-consciousness, and sadness, whereas the latter involved externalizing behaviors characterized by aggression, disruptiveness, and noncompliance. The KSCS factors are thus quite similar to those reported for other instruments.

Interrater reliability coefficients are reasonable for both of the KSCS factors. Kohn and Rosman (1972, 1973) found that

teacher correlations ranged from .70 to .79 for the IP-AW factor and from .76 to .82 for the CC-AD factor. The short-term stability of both factors is comparable to levels found by other researchers using similar instruments (Achenback & Edelbrock, 1983; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Quay & Peterson, 1983 as cited in Quay & Werry, 1986). In Kohn and Rosman's study (1972), the test-retest coefficients over a six month interval were .66 for the IP-AW factor and .75 for the CC-AD factor (Kohn & Rosman, 1972).

In support of the construct validity of the IP-AW factor, a positive relationship has been reported between this factor score and both the Extraversion-Introversion factor score of the Schaefer Classroom Behavior Inventory (Kohn & Rosman, 1972), teacher and peer rated popularity (Begin, 1983; Begin & Boivin, 1986; Connolly & Doyle, 1981), and observed social participation frequencies (Strayer, 1984). Moreover, high IP-AW scores were associated with low Apathy-Withdrawal factor scores on the Kohn Problem Checklist (Kohn and Rosman, 1972) and low Withdrawal factor scores on the Walker Problem Behavior Identification Checklist (Begin, 1983). With respect to the construct validity of the CC-AD factor, high scores on this factor are associated with low scores on the Anger-Defiance factor of the Kohn Problem Checklist and on the Conduct Problems factor of the Peterson Problem Checklist (Kohn & Rosman, 1972). Observed frequencies of helping behavior (Jennings, Fitch, & Suwalsky, 1987) and teacher

ratings of global emotional functioning are also associated with high scores on both KSCS factors (Kohn & Rosman, 1972).

IP-AW factor scores are positively correlated with scores on Greenwood's Positive Social Behavior Scale (Begin, 1983). Children scoring high on the CC-AD factor have scored high on measures of self-control (Humphrey & Kirshenbaum, 1981) and teacher and peer rated popularity (Begin, 1983; Begin & Boivin, 1986; Connolly & Doyle, 1981). Moreover, characteristics, such as cooperativeness and compliance to routines of children scoring high on the CC-AD factor are correlates of popularity (Hartup, Glazer, & Charlesworth, 1967; Moore, 1967).

Negative sociometric status has also been linked with the CC-AD factor. Boivin and Begin (1986) found that, as the CC-AD scores of kindergarten children decreased, peer rejection scores increased. Foster & Ritchey (1985) reported that peer rejected school-aged children had significantly lower CC-AD scores than accepted and neglected children.

Observational Coding Scheme. The observational coding scheme identified what a child was doing in the playground, with whom he or she was playing, and what his or her specific location was.

Six social participation categories, six activity categories, and three aggression categories were used in coding the children's play behavior (See Appendix D). Developed by Parten (1932) and Smilansky (1968) respectively, the social participation and activity categories are useful for several

reasons. Pellegrini and Perlmutter (1989) assert that these categories account for most of preschoolers' play behaviors. Moreover, these categories are sensitive to age and sex differences in children's play (Pellegrini & Perlmutter, 1989), SES differences in children's play (Rubin, Maioni, & Hornung, 1976), and the contexts within which various forms of play take place (Johnson & Ershler, 1981; Pellegrini, 1984; Rubin & Seibel, 1979 as cited in Pellegrini, 1985).

Parten's social participation categories are the following: unoccupied; solitary; onlooker; parallel; associative; and cooperative. These categories are arranged in increasing order of social involvement.

The six activity categories used in the study were fine-motor, motor, dialogue, constructive, fantasy, and games. With the exception of fine motor, motor, and dialogue, these categories are identical to those of Smilansky (1968), which, ordered in terms of cognitive complexity, were based on Piaget's (1962) theory of play and intelligence. Fine-motor behavior, a category added by the author, included part of Smilansky's category of functional play (repetitive muscle movement with or without objects) plus any other activity in which an object is used without changing its use or creating something new. A separate category for gross motor play was also included because this seems to occur frequently in the preschool playground (Brown & Burger, 1984; Hart & Sheehan, 1985). Dialogue was included as a separate category when pilot work showed that conversation

which was not part of cooperative construction or fantasy play occurred frequently among preschoolers.

Since Parten's (1932) system does not include negative social interactions, aggression categories were added. The three aggression categories were as follows: aggression against (target child is the victim of aggression); aggression initiated (target child aggresses against another child); retaliatory aggression (target child uses aggression in response to being the victim of an aggressive act). The latter two categories parallel Dodge and Coie's (1987) distinction between proactive and reactive aggression and Pulkkinen's (1983) distinction between initiative/offensive and defensive aggression. However, since the three different aggression categories occurred so seldom, following data collection they were collapsed to form a composite aggression category. This type of grouping appeared justified since the three types of aggression have been found to be highly correlated. Dodge and Coie (1987) found that grades 1 and 3 boys who displayed high rates of reactive aggression also displayed high rates of proactive aggression. Price and Dodge (1989) found that, for kindergarten and grade 1 boys, directing proactive forms of aggression toward peers was positively related to being the target of proactive aggression. If a child initiated aggression, there was an associated instance of victimization (aggressed against) and if a child retaliated with aggression, this was always preceded by an instance of aggression initiated. Since aggression was expected to occur at low rates, the best

estimate of where aggression took place would combine these three categories of aggression.

Observers coded only the most complex of two concurrent behaviors within the same class of categories. For example, if both motor and constructive play were occurring, only the latter was coded. In most intervals one social participation and one activity category were coded. However, only one category was coded when unoccupied or onlooker behaviors or any form of aggression occurred.

The observational scheme used in the present study also coded the names of the children with whom the target child was playing and whether the target child was interacting with a teacher. If more than five children were playing with the target child, only the total number of children and not their identities was recorded. Information on the target children's playmates, however, was not analyzed further.

Finally, observers coded the specific location of the target child by referring to coded maps which delineated spatially or functionally distinct parts of the play structures and open space (see Appendix B). These spatially/functionally distinct areas were later collapsed into four general types (private areas, play structures, pavement, sand).

Observer Training and Reliability

Two observers, a doctoral student and a fourth year undergraduate student, trained for four months before actual data collection began. Training took place for an hour each day and consisted either of direct observation in a public park which had playground equipment, coding children's play from video-tapes, or, in the last few weeks of training, coding in the actual playgrounds involved in the study. Training ended and data collection began when interrater reliability in the form of percent agreement exceeded 75% for observations in the day care settings. Note that percent agreement was calculated by a conservative method where each disagreement was counted twice (once for each category coded by the two raters) rather than by a more typically used, more liberal method in which disagreements are counted only once.

Reliability checks, conducted on 10% of observations, continued throughout the actual data collection period to ensure acceptable levels of agreement between the observers were maintained. Periodic discussions and review by observers continued through the observational phase of the study. By randomly choosing one of the observer's observational data, data collected for reliability checks were also included in analyses.

When data collection ended, in order to take chance agreement into account (Conger, 1980), interjudge reliability was examined through the calculation of kappa coefficients. According to Landis and Koch (1977b), values equal to or less than .40

indicate slight to poor agreement, those from .41 to .60 moderate agreement, those from .61 to .80 substantial agreement, and those larger than .80 excellent agreement. In this study, interrater reliability was substantial to excellent. Kappa coefficients were based on observations across the four playgrounds except that coefficients for the play area categories and playmate(s) of the target child were broken down by playground.

Across all social participation categories, a kappa value of .80 was obtained. The values for the individual social participation categories were as follows: unoccupied, $K=.75$; solitary, $K=.82$; onlooker, $K=.73$; parallel, $K=.77$; associative, $K=.76$; cooperative, $K=.91$.

Across all activity categories, the kappa value was .66. Kappa values for the individual categories were as follows: fine motor, $K=.63$; motor, $K=.92$; dialogue, $K=.77$; associative, $K=.76$; cooperative, $K=.91$.

Across all aggression categories, the kappa value was .77. Since there were very low rates of aggression in this sample, separate coefficients for each aggression category were not calculated.

Across all play area categories, a kappa value of .95 was obtained for Playground 1, of .98 for Playground 2, of .96 for Playground 3, and of .96 for Playground 4. Finally, the raters' coding of the target child's interaction with teachers, yielded coefficients of .83, 1, 1, and .91 for Playgrounds 1 to 4 respectively.

Procedure

Observations were conducted from September, 1987 to December, 1987 and were distributed across every week day and every period of the school day. The order in which subjects were observed was determined randomly within each daycare.

To minimize their effect on children's behavior, observers positioned themselves in an unobtrusive place in the playground and maintained a lengthy distance from the target child while collecting data. Observers reacted as little as possible to the approaches made to them by the children. Previous research with preschool children has shown that most preschoolers respond minimally to passive observers and do so only within the first few observation periods (Connolly & Smith, 1972).

When a child was randomly chosen for observation, his or her behavior was coded over a six minute session. A signal from a tape played on a Walkman cassette player indicated when to observe the target child. Five seconds later, another signal was given for the observer to code. This interval lasted 10 seconds to enable the observer to record the target child's behavior, playmates, and location. In total, there were 24 15-second intervals in each observational session. The majority of children were observed for eight sessions over a total of forty-eight minutes. However, due to absenteeism and the random nature of observations, some children were observed on fewer or more occasions.

To help the observers identify target children during the first month, jackets with letters were placed on the preschoolers prior to outdoor play. Children from the younger age group not included in the research had no jackets and, when playing with a target child, were merely coded as younger playmates. To code the children's location, observers referred to maps with numbers representing specific locations both on play structures and in open space.

A few weeks after observations began, the teacher most closely connected to each participating child was given the Kohn Social Competence Scale (Kohn & Rosman, 1972) to complete. Teachers were asked not to consult with other staff members during completion of the scale.

Derived Measures

Proportion of Time Spent in Each Observational Category or Play Area In Relation To Total Play. The observational measures yielded frequency data for each observational category. However, since each subject was not observed for an equal amount of time, frequency data was converted into proportional data. For each subject, the frequency count for each social participation category, aggression, and activity category, and for each of the four general types of play areas and each of the spatial-functional areas was divided by the frequency of intervals of total play time observed.

Proportion of Play in Each Observational Category in Each Play Area. To determine whether behavior varied as a function of observed play area, the frequency count for each observational category in each spatial-functional area and each of the four general types of play areas (private areas, play structures, pavement, sand) was divided for each subject by the total frequency of play in that area. For example, if Subject 1 played in Area 1 10 times and engaged in unoccupied play two times while he was there, the proportion of unoccupied play to total play in area 1 would be .20.

Total play in each area was used as the denominator rather than total overall play in order to control for differences in size and popularity across play areas. More specifically, if total overall play had been used as the denominator, one would expect by chance that children would spend more of their overall play time in larger areas than in smaller areas and, in turn, proportions of all types of play would be higher in the larger areas. Moreover, proportions of all types of play would be higher in the more popular areas. Thus, when comparing the proportions of each category in each of the play areas, it would be impossible to determine whether a certain area yielded larger proportions of a given type of play because of the nature of the area or because of its size or popularity. When the total play in each area is used as the denominator rather than overall total play, ambiguities involving unequal size or popularity of areas disappear.

Rates of Teacher Interaction for Each Play Area. To examine where interactions with teachers took place on the playground, the frequency of teacher interaction for each subject in each of the spatial-functional areas and each of the four general types of play areas (private areas, play structure, pavement, sand) was divided by the total frequency of play in that area. For reasons outlined above, total frequency of play in each area served as the denominator rather than overall frequency of play.

Classification of Internalizing and Externalizing Behaviors. Each preschooler received both an IP-AW and CC-AD factor score. To categorize subjects as high, average, or low on internalizing or externalizing behavior, cut-off points of one standard deviation above or below the means for the IP-AW and CC-AD KSCS factor scores were used. The aim was to choose subjects who were extreme enough so that differences between high, average, and low groups would be maximized while also maximizing the number of subjects in each group. As recommended by Kohn, Parnes, and Rosman (1979), means and cut-off scores were calculated separately for each playground. If a subject's IP-AW and CC-AD scores were both high or both low, this subject was categorized neither as a high/low internalizer nor as a high/low externalizer. Table 1 lists, by playground, the number of subjects with high and low KSCS factor scores.

Table 1

Number of Subjects With High or Low Kohn Social
Competence Scale (KSCS) Factor Scores by Playground

Playgrnd	<u>IP-AW Score</u>		<u>CC-AD Score</u>		<u>On Both Scr</u>	
	High	Low	High	Low	High	Low
1	2	2	4	1	0	2
2	3	4	3	5	0	1
3	2	1	0	2	2	1
4	1	1	2	2	0	0
Total	8	8	9	10	2	4

Note. Scr=Score; Playgrnd=Playground. One standard deviation above and below the mean defines a score as high or low. Subjects high or low on both of the KSCS scores are not included in the individual IP-AW and CC-AD columns.

Proportion of Play in High, Moderate and Low Density Areas.

To examine whether children varying on social competence played in areas differing on social density, social density coefficients were calculated for each specific or more general type of play area in each playground. This was done by dividing the average proportion of play occurring in each area for all subjects by the square feet of that area. Next, by performing a tertile split, each area within a playground was classified as high, moderate or low in social density. Finally, the proportion of time each subject spent in the different areas was calculated.

Intensiveness and Extensiveness of Play . To investigate social competence and sex differences in location of play and to determine whether children limited their use of space or explored widely in their environment, two scores were employed. First, a measure of how intensively each child played was calculated. This consisted of the proportion of time spent in a child's most preferred play area (Intensiveness). The most preferred play area was defined as the area with the highest proportion of play. Second, a measure of how extensively each child used his or her play environment was calculated. This score took the number of areas a child had been present in at least once and divided this number by the total number of areas in the playground (Extensiveness).

Proportion of Play Close To or Far From the School. To examine whether females played closer to the school and males played farther from the school, it was necessary to categorize areas on the playground accordingly. Areas bordering the preschool building were defined as "close to the school", whereas areas bordering the wall or fence furthest away from the building were defined as "far from the school". Areas were not categorized as close or far if they were adjoining or touching one another or if they covered half or more than half of the length of the playground. In Appendix B, the maps of the playgrounds delineate which areas were classified as "close to the school" and those which were classified "far from the school".

Data Analyses

The statistical analyses can be divided into two types: analyses conducted to provide descriptive information on the sample and measures and analyses conducted to test the research hypotheses. Below is an outline of the analyses that were conducted.

Descriptive Analyses. Intercorrelations among all measures used in the study were computed.

To examine whether behavior varied as a function of sex and playground, four one-way multivariate analyses of variance were conducted. The independent variable was either sex or

playground, and the dependent variables were either the social participation categories including the composite aggression category or the activity categories.

To determine whether children differing on the internalizing and externalizing measures played differently, four one-way MANOVAs were conducted. The independent variable was either the level of the IP-AW score or the CC-AD score (high, average, low). For two of the MANOVAs, the dependent variables were the social participation categories and composite aggression category and for the other two MANOVAs, the dependent variables were the activity categories.

Finally, to determine whether the samples of children on the four playgrounds differed on the IP-AW and CC-AD scores, a one-way MANOVA was conducted.

Hypothesis-Based Analyses. Separate repeated measures analyses of variance were conducted for each observational category with playground serving as the between-subjects variable and type of play area (private, apparatus, pavement, sand) as the within-subjects variable. With these analyses, it was possible to determine whether the relative frequency of play in each behavioural category varied as a function of the four general types of play area delineated in this study's classification scheme.

To examine whether internalizing and externalizing preschoolers distributed their play differently from other

children, separate one-way MANOVAs were conducted. The between-subjects factor was the level of IP-AW or CC-AD score (high, average, low). The dependent or use of space variables were extensiveness of play, intensiveness of play, and proportion of play in high density areas, moderate density areas, and low density areas.

To investigate whether males and females differed in their use of different play areas, a one-way MANOVA was conducted with sex serving as the independent measure and proportion of play in private areas, on play structures, on sand, and on pavement, proportion of time spent playing close to the school and far from the school, and extensiveness and intensiveness of play serving as the dependent measures.

Results

Descriptive Statistics

Time Spent in Different Categories of Behavior

In Tables 2 and 3, the mean proportion of time spent in each category of behavior (frequency count for each category/frequency of intervals of total play time) is given for each playground and sex separately and for all subjects collapsed across playgrounds. With respect to the social participation categories, when collapsing data across playgrounds, differences between categories did not appear marked. With respect to the activity categories, for each playground separately and across the four playgrounds, approximately half of play was coded as motor play, approximately one quarter as dialogue, and approximately one tenth as fine motor play. Fantasy play, constructive play, and games were coded fairly infrequently. Finally, there were very low rates of aggression across playgrounds.

Intercorrelations Among Measures

Appendix E presents intercorrelations between all dependent measures. Correlations between subject variables (age, IP-AW score, CC-AD score) and the observational measures are presented in Table 4.

As age increased, frequencies of associative play ($r=.35$, $p<$

Table 2
Means for Social Participation Categories by
Playground and Sex

Grp	n	Categories						
		Uno	Sol	Onl	Par	Ass	Coo	Agg
P1	24	.20	.20	.12	.19	.21	.08	.01
P2	18	.12	.13	.14	.19	.21	.21	.01
P3	13	.12	.19	.13	.20	.24	.11	.01
P4	13	.13	.19	.12	.18	.20	.18	.01
Mal	40	.15	.19	.10	.19	.23	.14	.01
Fem	32	.16	.17	.15	.18	.20	.14	.01
Tot	72	.14	.18	.13	.19	.21	.15	.01

Note. Grp=Group; Uno=Unoccupied; Sol=Solitary;
 Onl=Onlooker; Par=Parallel; Ass=Associative; Agg=
 Aggression; P1=Playground 1; P2=Playground 2; P3=
 Playground 3; P4=Playground 4; Mal=Males; Fem=
 Females; Tot=Total. Proportions are based on
 untransformed data. Rows sum to 1.

Table 3
Means for Activity Categories by Playground
and Sex

Grp	n	Categories					
		FMo	Mot	Dia	Con	Fan	Gam
P1	28	.10	.52	.22	.06	.08	.01
P2	18	.12	.52	.22	.04	.08	.01
P3	13	.11	.42	.27	.08	.10	.01
P4	13	.10	.50	.21	.08	.11	.01
Mal	40	.10	.52	.23	.05	.09	.01
Fem	32	.12	.48	.23	.07	.09	.01
Tot	72	.11	.50	.23	.06	.09	.01

Note. FMo=Fine motor; Mot=Motor; Dia= Dialogue; Con=Constructive; Fan=Fantasy; Gam=Game; P1=Playground 1; P2=Playground 2; P3= Playground 3; P4=Playground 4; Mal=Males; Fem= Females; Tot=Total. Means are based on untransformed data. Rows sum to 1.

Table 4

Correlations between the KSCS Factor Scores, Age and the Observational Measures, Proportion of Total Play in Different Types of Areas, and Extensiveness and Intensiveness of Play

Measures	KSCS Scores		Age
	IP-AW	CC-AD	
Observational Measures			
Unoccupied	-.27*	.22	-.13
Solitary	-.17	.19	.05
Onlooker	-.15	.02	-.33**
Parallel	-.17	-.04	-.14
Associative	.37**	-.13	.35**
Cooperative	.32**	-.20	.14
Aggression	-.05	-.16	-.06
Fine Motor	-.27*	.17	-.30*
Motor	-.21	-.01	-.17
Dialogue	.16	-.15	.16
Constructive	.03	.06	.09
Fantasy	.36**	-.05	.22
Games	.16	-.02	.29*

(table continues)

Measures	KSCS Scores		Age
	IP-AW	CC-AD	
Proportion of Total Play in Different Types of Area			
Private Areas	.01	-.13	.05
Pavement	-.06	.07	-.07
Sand	.06	.12	-.08
Play structures	.08	-.07	-.04
Close to school	-.12	-.02	-.02
Far from school	.21	-.20	.11
H density areas	-.09	-.13	-.11
M density areas	.01	.25*	.01
L density areas	.10	-.14	-.09
Extensiveness and Intensiveness of Play			
Extensiveness	.26*	-.07	-.15
Intensiveness	-.01	-.14	.12

Note. Higher IP-AW and CC-AD scores indicate lack of internalizing and externalizing behaviors respectively. Correlations were computed using untransformed data.

* $p < .05$. ** $p < .01$.

.05) and games ($r=.29$, $p<.05$) increased, whereas onlooker behavior ($r=-.33$, $p<.05$) and fine motor play ($r=-.30$, $p<.05$) decreased. As scores on the IP-AW factor of the KSCS increased (indicating fewer internalizing behaviors), associative play ($r=.37$, $p<.05$), cooperative play ($r=.32$, $p<.05$), fantasy play ($r=.36$, $p<.05$), and extensiveness of play ($r=.26$, $p<.05$) increased, whereas unoccupied behavior ($r=-.27$, $p<.05$) and fine motor play ($r=-.27$, $p<.05$) decreased. Finally, as the CC-AD factor score increased (indicating fewer externalizing behaviors), the proportion of total play in moderate density areas ($r=.25$, $p<.05$) increased.

Sex and Playground Differences in Observational Categories

The four playgrounds differed in the ratio of male to female subjects. Playgrounds 1 and 2 had an equal distribution of the sexes whereas Playgrounds 3 and 4 had a predominance of male subjects. Thus, it was important to know if any sex differences in behavior existed, since any such differences could create differences among the playgrounds in addition to differences attributed to the physical environment. It was also possible that the four daycare centres had different types of children, thus confounding behavioral differences with environmental differences.

To determine whether there were sex or playground differences on the observational measures, four one-way MANOVAs were conducted. The independent variable was either sex or playground

and the dependent variables were either the social participation categories (including the composite aggression category) or the activity categories. The means for these analyses are presented in Tables 1 and 2.

Note that Playground X Sex differences in play were examined in analyses not reported here. Interaction effects were not significant in any of the analyses. Thus, to increase cell sizes and the power of the analyses, one-way MANOVAs were used instead of factorial MANOVAs for the examination of the independent variables of playground and sex.

For these four MANOVAs and all others conducted henceforth, the following assumptions were tested: multivariate normality; multivariate homogeneity of covariance matrices; and multicollinearity. For all MANOVAs, a significant F test was followed by univariate F tests. For all such analyses, a significant F test was followed by the Tukey post hoc procedure in order to determine which pairs of groups differed significantly on a variable.

It is important to note that screening of all data prior to analyses showed that most of the data distributions were abnormal and that in all cases, the square root transformation was the best type of modification for normalizing the data. Although most of the data in this study was nominal/proportional data and in such a case, it is customary to use arcsine transformations, this was not done. According to Brown (1966, p.1047), the various transformation techniques differ so slightly that

differences among them are largely theoretical. In fact, some of the analyses were conducted in two ways, with square root transformations and with arcsine transformations, and results were the same in both cases.

Sex Differences on the Observational Measures. Neither of the two MANOVAs, one conducted with the six social participation and composite aggression category and the other with the six activity categories, demonstrated significant sex differences.

Playground Differences on the Observational Measures. The MANOVA conducted with the six social participation and composite aggression category demonstrated significant differences among the playgrounds, $F(21,192)=2.29$, $p<.05$. Univariate F tests demonstrated significant effects of playground on unoccupied ($F(3,68)=6.14$, $p<.05$) and cooperative play ($F(3,68)=9.38$, $p<.05$). Pair-wise comparisons indicated that unoccupied play occurred significantly more often on Playground 1 ($M=.20$) than on any other playground (Playground 2 - $M=.12$; Playground 3 - $M=.12$; Playground 4 - $M=.13$). Cooperative play occurred more frequently on Playground 2 ($M=.21$) than on Playgrounds 1 ($M=.08$) or 3 ($M=.11$), and more frequently on Playground 4 ($M=.18$) than on Playground 1.

KSCS Factor Score Differences on the Observational Categories

To examine the validity of the internalizing and externalizing measures, the play behaviors of children scoring high, average or low on these measures were compared. Four one-way MANOVAs were conducted with low, average, or high scores on the IP-AW or the CC-AD factor of the KSCS serving as the levels of the independent variable. Two of the MANOVAs looked at the social participation categories including the composite aggression category and two at the activity categories. Tables 5 and 6 present the means for these analyses. Note that for statistical purposes, the number of children randomly chosen to represent the average internalizers/externalizers was approximately the same as the number of children categorized as high and low internalizers/externalizers.

IP-AW Factor Score Differences on the Observational Measures

The MANOVA conducted with the social participation categories and aggression category showed significant differences between children scoring high, average, and low on the IP-AW factor, $F(14,32)=2.45, p<.05$. Univariate F tests demonstrated significant differences between the groups on associative play, $F(2,21)=10.57, p=.05$. Pairwise comparisons showed that children scoring high or average on the IP-AW factor (low and average internalizers) had significantly higher proportions of

Table 5
Means for Social Participation Categories by
Kohn Social Competence Scale Category

Cat	n	Categories						
		Uno	Sol	Onl	Par	Ass	Coo	Agg
IP-AW Score								
Hgh	8	.13	.12	.13	.16	.28	.18	.01
Avr	8	.17	.18	.11	.18	.18	.16	.01
Low	8	.21	.19	.19	.19	.14	.08	.01
CC-AD Score								
Hgh	9	.18	.23	.13	.19	.14	.11	.01
Avr	10	.17	.20	.12	.15	.24	.18	.01
Low	10	.11	.15	.11	.20	.22	.21	.01

Note. Grp=Group; Uno=Unoccupied; Sol=Solitary;
 Onl=Onlooker; Par=Parallel; Ass=Associative; Agg=
 Aggression; Hgh=high; Avr=average. Proportions are
 based on untransformed data. Rows sum to 1.

associative play than children scoring low (high internalizers), low internalizers- $\bar{M}=.53$, average internalizers, $\bar{M}=.45$, high internalizers, $\bar{M}=.36$. The MANOVA conducted with the activity categories did not demonstrate significant differences between groups.

CC-AD Factor Score Differences on the Observational Categories The MANOVA conducted with the social participation categories and the aggression category showed significant differences between children scoring high, average, and low on the CC-AD factor, $F(14,42)=1.98$, $p<.05$. Univariate F tests demonstrated that the groups differed on proportion of time spent in associative play, $F(2,26)=5.09$, $p<.05$). Children scoring low or average (high and average externalizers) spent significantly more time in associative play than children scoring high (low externalizers), high externalizers- $\bar{M}=.46$; average externalizers- $\bar{M}=.46$; low externalizers- $\bar{M}=.37$.

The MANOVA conducted with the activity categories also demonstrated significant differences between high, average, and low scorers on the CC-AD factor, $F(12,42)=2.15$, $p<.05$. Univariate F tests showed that the groups differed significantly on proportion of time spent in dialogue ($F(2,25)=7.57$, $p<.05$) and

Table 6

Means for Activity Categories by Kohn Social Competence Category

Cat	n	Categories					
		FMo	Mot	Dia	Con	Fan	Gam
IP-AW Score							
Hgh	8	.07	.42	.29	.06	.14	.02
Avr	8	.12	.48	.22	.06	.17	.01
Low	8	.32	.53	.19	.05	.04	.01
CC-AD Score							
Hgh	9	.20	.56	.14	.03	.05	.00
Avr	10	.10	.45	.27	.08	.09	.01
Low	10	.10	.51	.23	.06	.09	.00

Note. Cat=Category; FMo=Fine motor; Mot=Motor; Dia=Dialogue; Con=Constructive; Fan=Fantasy; Gam=Game; Hgh=High; Avr=Average. Means are based on untransformed data.

games ($F(2,25)=6.48$, $p<.05$). Pairwise comparisons showed that children with low or average scores (high and average externalizers) spent more time in dialogue than children with high scores (low externalizers), high externalizers- $M=.23$, average externalizers- $M=.27$, low externalizers- $M=.14$. Average scorers spent more time in games than low or high scorers, average externalizers- $M=.05$, high externalizers- $M=.00$, low externalizers- $M=.00$.

KSCS Factor Scores Across Playgrounds

To determine whether subjects from different playgrounds differed on the IP-AW and CC-AD factor scores of the KSCS, a one-way MANOVA was conducted. It was not significant. Table 7 presents the means and standard deviations of these scores by playground.

Proportion of Play in Each Play Area

Playgrounds had been partitioned in two ways. The first delineated spatially or functionally distinct parts of the play structures and open space. The second classified the larger number of distinct areas into four general types (private, apparatus, pavement, sand). In Appendix F, one can find, for

Table 7

Means for the Kohn Social Competence Scale (KSCS)
Factors by Playground

Playground	n	KSCS Scores	
		IP-AW	CC-AD
1	24	11.5 (29.0)	154.1 (31.3)
2	18	13.4 (33.8)	132.6 (31.1)
3	13	5.8 (31.5)	143.1 (31.3)
4	13	17.8 (29.9)	147.5 (26.8)

Note. Standard deviations are in parentheses.

each playground, in descending order of frequency, the mean proportion of play in these areas.

Mean proportions of time spent in play tended to be higher for areas which were larger and open (sand, pavement, grass) than for areas which were smaller and included play equipment. However, the proportions of play were very high on swings in comparison to proportions in other areas. With respect to the four general types of play areas, in all four playgrounds the smallest proportions of time spent in play were found for private areas, which were also the smallest areas. The difference between play in private areas and other areas was less pronounced in Playground 3, however, in which there were three private areas in contrast to only one in the other playgrounds.

One of the purposes of the present study was to examine the effects of the physical environment on children's play. To ensure that this did not merely reflect effects of the social environment, the relation of physical features of the environment to overall social densities and the presence of an adult was examined.

Play Areas and Social Density

Social density coefficients were calculated by dividing the mean proportion of total time spent in each play area for all children by the square footage of that area. In Appendix G, one can find, in descending order of frequency, the social density coefficients for each of the spatial-functional areas and each of

the four general types of areas. Spatial-functional areas have been categorized as either high, moderate, or low in population density on the basis of a tertile split.

Generally, across the four playgrounds, the high social density areas were smaller in size than the moderate and low social density areas, and consisted of parts of the play structures (including parts labelled as private areas). A few exceptions did exist. Sandboxes (as opposed to more undelineated sand areas) had high social density coefficients. Two large areas, the sandbox in Playground 1 and the pavement in Playground 4, were very densely populated. The low social density areas were usually open areas (grass, sand, pavement). In all four playgrounds, the play structure and private areas had higher population densities than pavement and sand.

Teachers' Interaction with Children

Appendix H presents the mean proportion of total time that teachers interacted with a target child in a given area. However, some areas had so few observations overall that they were not included in this rank ordering.

Rates of teacher interaction tended to be higher in large open areas (sand, pavement, grass) than on parts of the play structures for Playgrounds 1 and 3. Areas under the play structure which afforded more difficult access by adults and poorer visibility to other play areas had lower rates of teacher interaction on Playgrounds 1, 2, and 4. Differences between

areas did not appear marked for rates of teacher interaction in the four general play areas (private areas, pavement, sand, play structures).

Hypothesis-Based Analyses

Play Areas and Localization of Behaviour

To determine whether the relative proportion of observations in each behavioral category varied as a function of the four general types of play areas (private, apparatus, pavement, sand), separate 4 (Playground) X 4 (Play Area) repeated measures analyses of variance were conducted for each behavioral category. Note that there was no separate examination of the main effect of playground (nonrepeated factor) since previously reported multivariate analyses already investigated whether behavioral differences existed across playgrounds. If there was a significant interaction between the repeated (play area) and nonrepeated (playground) factors, the simple main effects of the repeated factor were examined. To do this, four single factor repeated measures analyses were conducted (one for each playground) and, if any of these analyses were significant, the Tukey test was used to conduct pair-wise comparisons. Tables 8 and 9 present for each general type of play area the mean proportion of time spent in each behavioral category to total play in the area.

Prior to these analyses, data screening had shown that there were 23 subjects who were never observed playing in private areas. Since one of the measures was not repeated for these subjects, they could not be included in the repeated measures analyses. In order to examine whether the subjects who were observed to play in private areas differed from those who were not observed in these areas, three MANOVAs were conducted with the following sets of dependent measures: the six social participation categories plus the composite aggression category, the six activity categories, and the two KSCS factor scores.

The three MANOVAs did not demonstrate any significant differences between subjects who played in private areas and those who did not. Appendix K presents the means for these two groups on each of the dependent measures. Subsequent analyses omitted those subjects who had never played in a private area.

Unoccupied Play. A 4 (Playground) X 4 (Play Area) repeated measures ANOVA for unoccupied play showed significant main effects for play area ($F(3,135)=6.44, p<.05$). Pair-wise comparisons of the different play areas, collapsing across playgrounds, were used to investigate which means differed from one another. Significantly higher proportions of unoccupied play occurred on pavement and on sand than on play structures or in private areas.

Table 8
Mean Proportion for Social Participation Categories
in Each Area

Area	Playgrounds				Total
	1	2	3	4	
Unoccupied					
Pr	.237	.146	.102	.066	.138
Pa	.255	.145	.129	.146	.169
Sa	.239	.136	.136	.145	.164
Pl	.117	.106	.085	.075	.096
Solitary					
Pr	.052	.225	.077	.244	.150
Pa	.188	.149	.202	.191	.183
Sa	.173	.164	.194	.198	.182
Pl	.501	.069	.185	.140	.224
Onlooker					
Pr	.105	.306	.080	.000	.123
Pa	.113	.129	.148	.145	.134
Sa	.121	.146	.140	.153	.140
Pl	.075	.079	.105	.076	.08

(table continues)

Area	Playgrounds				Total
	1	2	3	4	
Pr	.088	.094	.188	.360	.183
Pa	.141	.170	.165	.214	.173
Sa	.205	.166	.235	.173	.195
Pl	.138	.218	.313	.192	.215
Associative					
Pr	.456	.143	.275	.249	.281
Pa	.211	.243	.267	.195	.229
Sa	.202	.238	.195	.215	.213
Pl	.135	.172	.198	.151	.164
Cooperative					
Pr	.062	.087	.265	.081	.124
Pa	.085	.162	.075	.100	.106
Sa	.064	.145	.102	.109	.105
Pl	.042	.353	.111	.365	.218

(table continues)

Area	Playgrounds				Total
	1	2	3	4	
	Aggression				
Pr	.000	.000	.011	.000	.003
Pa	.005	.002	.012	.004	.006
Sa	.004	.004	.007	.006	.005
Pl	.000	.006	.000	.000	.002

Note. The number of subjects in each playground were as follows: Playground 1 - 15; Playground 2 - 13; Playground 3 - 13; Playground 4 - 8. Pr=Private area; Pa=Pavement; Sa=Sand; Pl= Play structures. Mean proportions are based on untransformed data. For each playground, the sum of the proportions for each area add up to 1.

Table 9
Mean Proportion for Activity Categories in Each Area

Area	Playgrounds				Total
	1	2	3	4	
	Fine Motor				
Pr	.009	.143	.135	.012	.075
Pa	.052	.075	.075	.112	.079
Sa	.164	.095	.102	.116	.119
Pl	.009	.054	.068	.070	.050
	Motor				
Pr	.218	.177	.145	.622	.416
Pa	.359	.339	.344	.352	.349
Sa	.164	.311	.201	.145	.205
Pl	.651	.537	.462	.611	.565
	Constructive				
Pr	.013	.000	.066	.097	.044
Pa	.006	.029	.010	.025	.018
Sa	.100	.035	.131	.193	.115
Pl	.000	.013	.006	.014	.008

(table continues)

Area	Playgrounds				Total
	1	2	3	4	
	Fantasy				
Pr	.095	.104	.215	.041	.114
Pa	.062	.086	.029	.081	.065
Sa	.042	.087	.045	.076	.063
Pl	.025	.061	.065	.035	.047
	Games				
Pr	.000	.009	.009	.016	.007
Pa	.006	.000	.029	.003	.010
Sa	.019	.003	.013	.005	.008
Pl	.007	.009	.019	.004	.010

Note. The total number of subjects in each playground was as follows: Playground 1 - 15; Playground 2 - 13; Playground 3 - 13; Playground 4 - 8. Pr=Private area; Pa=Pavement; Sa=Sand; Pl= Play structures; Mean proportions are based on untransformed data. For each playground, the sum of the proportions for each area add up to 1.

Solitary Play. A 4 (Playground) X 4 (Play Area) repeated measures ANOVA for solitary play showed a significant main effect of play area ($F(3,135)=6.27, p<.05$) and a significant Playground X Play Area interaction ($F(9,135)=5.84, p<.05$).

To explore the interaction between play area and playground, the simple main effects of the repeated factor were examined. The four single factor repeated measures analyses conducted (one for each playground) showed that the simple effect of play area was present only for Playgrounds 1 and 3 (Playground 1 - $F(3,42)=18.70, p<.05$; Playground 3 - $F(3,36)=6.75, p<.05$).

For Playground 1, pair-wise comparisons indicated significantly higher levels of solitary play on the play structures than on other play areas and significantly higher levels on pavement and sand than in private areas. For Playground 3, pair-wise comparisons showed that solitary play was significantly higher on pavement, sand, and on the play structures than in private areas.

Figure 1 illustrates the effects of play area on solitary play for each of the playgrounds. The figure suggests a marked difference between the play structure of Playground 1 and those of the other playgrounds in producing solitary play. Indeed, a follow-up one-way ANOVA with the dependent variable of play structure and the independent variable of playground was significant, $F(3,45)=14.09, p<.05$. Pair-wise comparisons showed that solitary play was significantly higher on the play structure of Playground 1 than on that of any of the other playground.

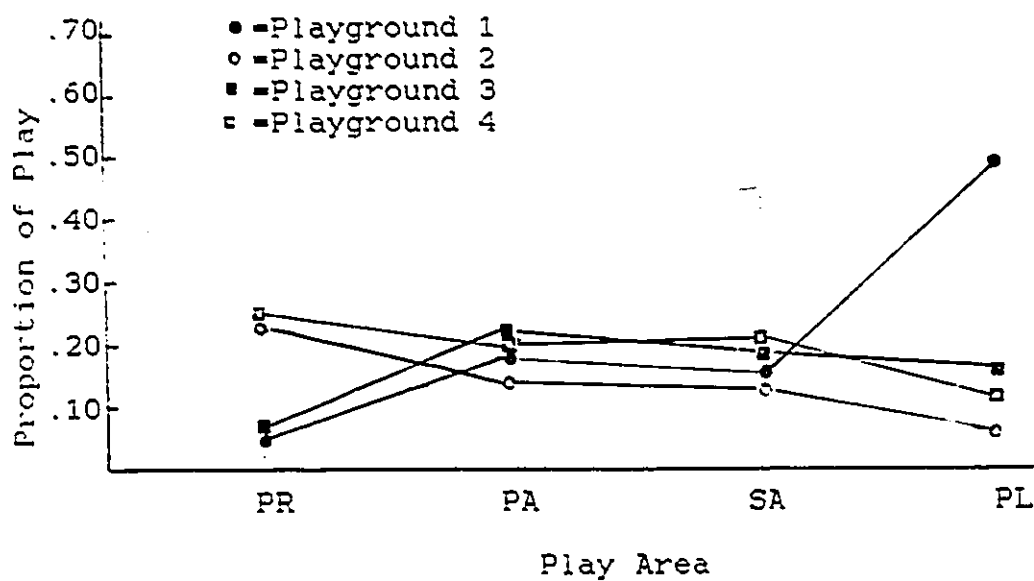


Figure 1. Solitary play as a function of play area (PR= private area; PA=pavement; SA=sand; PL=play structure)

Parallel Play. A 4 (Playground) X 4 (Play Area) repeated measures ANOVA on parallel play did not indicate a significant main effect of play area or a significant Playground X Play Area interaction.

Associative Play. A 4 (Playground) X 4 (Play Area) repeated measures ANOVA did not demonstrate a significant main effect of play area or a significant Playground X Play Area interaction.

Cooperative Play. A 4 (Playground) X 4 (Play Area) repeated measures ANOVA for cooperative play demonstrated significant main effect of play area ($F(3,135)=3.57, p<.05$) and a significant interaction between play area and playground ($F(9,135)=3.63, p<.05$).

The four single factor repeated measures ANOVAs conducted showed that the simple effect of play area was present only for Playground 2 ($F(3,36)=4.70, p<.05$). Pair-wise comparisons indicated that on Playground 2 significantly higher levels of cooperative play occurred on the play structure than in the private area.

Figure 2 illustrates the effects of play area on cooperative play for each of the playgrounds. The figure suggests a marked difference between the private areas of the different playgrounds and between the play structures of the different playgrounds. Two follow-up one-way ANOVAs with private area and play structure serving as the dependent variables and playground as the

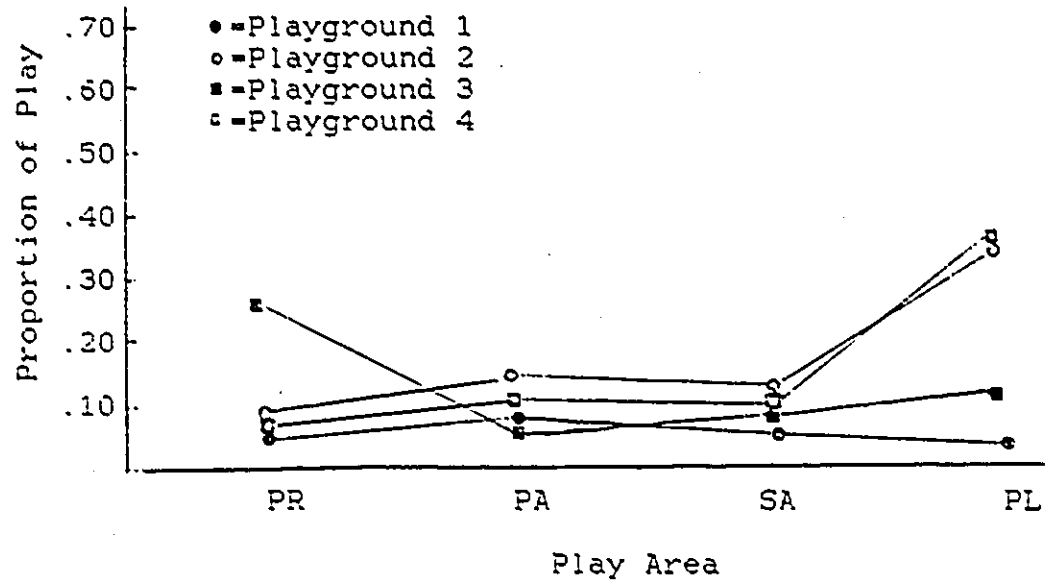


Figure 2. Cooperative play as a function of play area (PR=private area; PA=pavement; SA=sand; PL=play structure)

as the independent variable were significant ($F(3,45)=4.08$, $p<.05$, and $F(3,45)=7.61$, $p<.05$, respectively). Pair-wise comparisons indicated that significantly higher levels of cooperative play occurred in the private area of Playground 3 than in the private areas of Playground 1. Significantly higher levels of cooperative play occurred on the play structures of Playground 2 than on the play structures of Playgrounds 1 and 3 and there were also significantly higher levels on the play structures of Playground 4 than on the play structures of Playground 1.

Fine Motor Play. When a 4 (Playground) X 4 (Play Area) repeated measures ANOVA was conducted, the main effect of play area ($F(3,135)=10.66$, $p<.05$) and the interaction between play area and playground ($F(9,135)=2.57$, $p<.05$) were found to be significant.

Figure 3 illustrates the effects of play area on fine motor play for each playground separately. Single factor repeated measures analyses for each playground showed that the simple effect of play area was present only for Playgrounds 1 and 4 (playground 1 - $F(3,42)=25.82$, $p<.05$; Playground 4 - $F(3,21)=4.06$, $p<.05$). Pair-wise comparisons showed that on Playground 1 fine motor play was significantly higher on sand than on any other play area and significantly higher on pavement than in private areas or on play structures. On Playground 4, significantly higher levels of fine motor play were found on sand and pavement

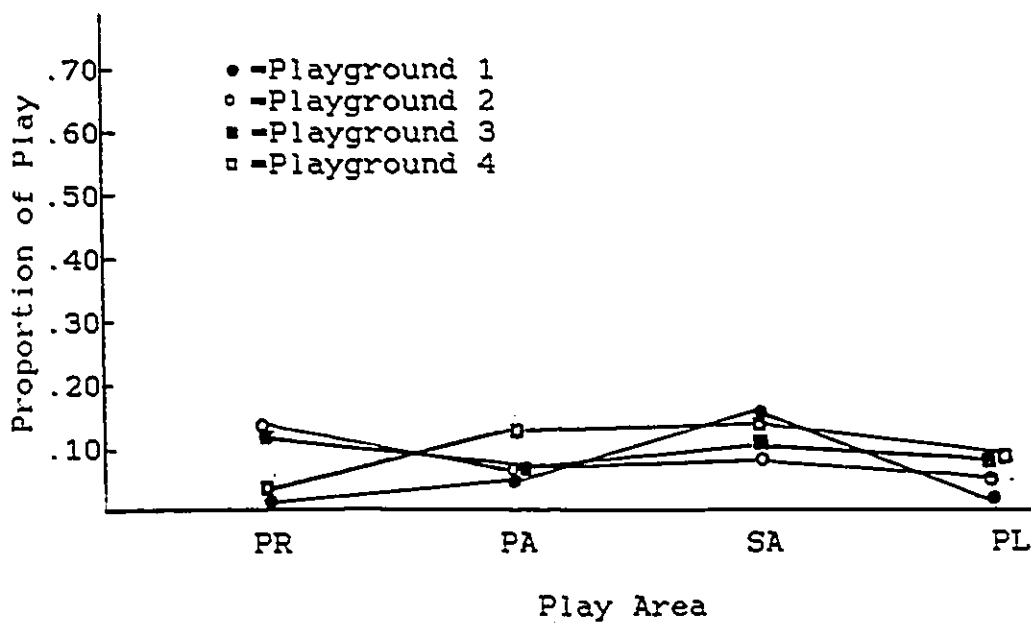


Figure 3. Fine Motor play as a function of play area (PR=private area; PA=pavement; SA=sand; PL=play structure)

than in private areas.

Motor Play. A 4 (Playground X 4(Play Area) repeated measures ANOVA on motor play demonstrated a significant main effect of play area ($F(3,135)=29.10$, $p<.05$) and a significant interaction between play area and playground ($F(9,135)=4.10$, $p<.05$).

The four single factor repeated measures analyses (one for each playground) demonstrated that the simple effects of play area were present at each playground (Playground 1 - $F(3,42)=16.44$, $p<.05$; Playground 2 - $F(3,36)=10.01$, $p<.05$; Playground 3 - $F(3,36)=9.02$, $p<.05$; Playground 4 - $F(3,21)=7.05$, $p<.05$). For Playgrounds 1 and 2, the results of pair-wise comparisons indicated significantly higher levels of motor play on the play structures than on any of the other play areas. On Playground 3, significantly higher levels of motor play occurred on play structures than sand or private areas, and significantly higher levels on pavement than private areas. Finally, on Playground 4, significantly higher levels of motor play occurred on the play structure and private area than sand. Figure 4 clearly illustrates that, irrespective of playground, higher levels of motor play occurred on play structures than in other play areas.

Fantasy Play. The 4 (Playground) X 4 (Play area) repeated measures ANOVA on fantasy play did not indicate a significant

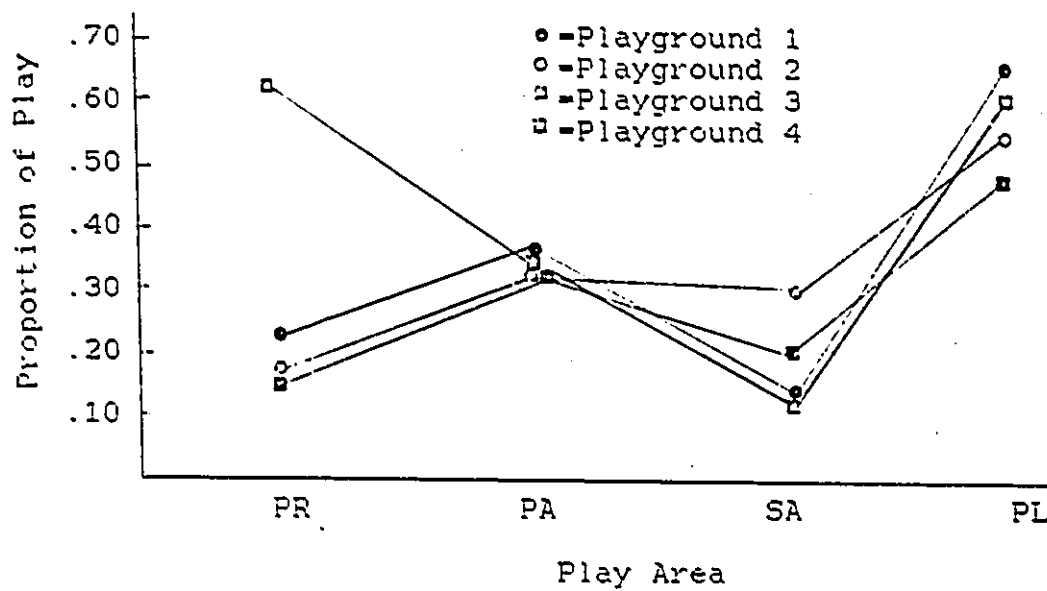


Figure 4. Motor play as a function of play area (PR-private area: PA-pavement: SA-sand: PL-play structure)

main effect of play area or a significant Playground X Play Area interaction.

Onlooker Activity, Dialogue, Constructive Play, Games, and Aggression. Because dialogue was so highly correlated with associative play ($r=.82$), a separate repeated measures analysis was not conducted for this measure. For the data on onlooker activity, constructive play, games, and aggression, the assumption of homogeneity of covariance-variance matrices could not be tested because of zero variance in one or more cells which resulted in a singular variance-covariance matrix. Unable to determine whether this assumption was met or violated, no conclusions could be reached about whether the level of alpha was at the nominal level or whether it was liberal or conservative (Tabachnick & Fidell, 1989, pg.378). Thus, it was decided not to conduct repeated measures analyses on these data.

Social Competence and Use of Play Space

To examine whether internalizing and externalizing preschoolers used play space differently from other children, two one-way MANOVAs were conducted with low, average, or high scores on either the IP-AW or the CC-AD factor of the KSCS serving as the levels of the independent variable. The MANOVAs each had five dependent variables: extensiveness of play; intensiveness of play; and proportion of time spent in high, moderate, and low density areas.

Neither of the MANOVAs indicated significant differences on the use of space variables between subjects scoring low, medium, or high on either the IP-AW or CC-AD factor. Table 10 presents the means for each of the use of space variables for low, medium, and high KSCS factor scorers.

Sex Differences in Use of Space and Use of Different Play Areas

A one-way MANOVA was conducted to examine whether males and females differed in the proportion of time spent in the four different types of play areas (private areas, apparatus, pavement, sand), in the proportion of time spent close to the school and far from the school, and in extensiveness and intensiveness of play. The MANOVA did not demonstrate significant sex differences in use of space. Table 11 presents mean scores for each of the dependent measures in this analysis by playground and sex.

Table 10

Means and Standard Deviations For Use of Space
Variables by Kohn Social Competence Scale (KSCS)
Category

Categ	Measure				
	Ext	Int	HDn	MDn	LDn
	IP-AW Score				
High	.77	.25	.28	.36	.36
(<u>n</u> =8)	(.16)	(.06)	(.72)	(.20)	(.17)
Aver	.68	.27	.25	.49	.25
(<u>n</u> =8)	(.06)	(.05)	(.15)	(.15)	(.15)
Low	.62	.26	.36	.38	.25
(<u>n</u> =8)	(.17)	(.08)	(.16)	(.17)	(.16)
	CC-AD Score				
High	.66	.29	.31	.45	.24
(<u>n</u> =9)	(.08)	(.09)	(.20)	(.25)	(.13)

(table continues)

Categ	Measure				
	Ext	Int	HDn	MDn	LDn
Aver (<u>n</u> =10)	.65 (.19)	.28 (.06)	.25 (.17)	.49 (.17)	.26 (.17)
Low (<u>n</u> =10)	.68 (.16)	.27 (.08)	.34 (.19)	.29 (.18)	.37 (.19)

Note. Categ=Category; Ext=Extensiveness of play; Int=Intensiveness of play; HDn/MDn/LDn/=Proportion of time spent in high density/ moderate density/ and low density areas; Aver=Average. High IP-AW and CC-AD scores indicate lack of internalizing and externalizing behaviors. Means and standard deviations are based on untransformed scores. Standard deviations are in parentheses. Proportions for time spent in high, moderate, and low density areas add up to 1.

Table 11

Proportional Use of Different Types of Play Areas
and Extensiveness and Intensiveness Scores by Sex
and Playground

G	Measures							
	Pr	Pa	Sa	Pl	Cl	Fa	Ex	In
Playground 1								
M ^a	.01	.39	.20	.19	.09	.06	.63	.29
F ^a	.02	.38	.24	.16	.11	.02	.60	.31
T	.02	.39	.22	.18	.10	.04	.62	.30
Playground 2								
M ^b	.02	.21	.30	.31	.21	.10	.75	.22
F ^b	.06	.13	.26	.34	.16	.09	.71	.25
T	.04	.17	.28	.33	.19	.10	.73	.24
Playground 3								
M ^c	.10	.25	.25	.14	.33	.18	.73	.23
F ^d	.11	.13	.38	.17	.22	.10	.77	.26
T	.11	.20	.30	.15	.29	.15	.74	.24

(table continues)

G	Measures							
	Pr	Pa	Sa	Pl	Cl	Fa	Ex	In
Playground 4								
M ^c	.02	.46	.28	.24	.34	.04	.69	.31
F ^f	.05	.55	.26	.14	.47	.01	.59	.29
T	.03	.49	.27	.21	.38	.03	.66	.30
Overall								
M	.00	.00	.00	.00	.22	.09	.69	.27
F	.05	.31	.29	.22	.19	.05	.66	.28

Notes. G=Group; Pr=Private area; Pa=Pavement; Sa=Sand; Pl=Play structure; Cl=Close to school; Fa=Far from school; Ex=Extensiveness of play; In=intensiveness of play; M=Males; F=Females; T=Total Proportions are based on untransformed data. For Playground 4, the proportional use of the private area, pavement, sand, and play structure sum to 1. These proportions do not sum to 1 for Playgrounds 1, 2, and 3 since these playgrounds contained grass which was not included in the analyses.

^an=14. ^bn=9. ^cn=8. ^dn=5. ^en=9. ^fn=4.

Discussion

In this study, preschoolers' activities in different areas of the playground were examined. Several interesting relationships emerged between the playground environment and behavior. However, this study failed to demonstrate variations in use of play space as a function of either sex or individual differences in externalizing and internalizing behaviors. The significance of these results and the possible influence of the social environment are discussed below.

The Play Behavior of Preschoolers on the Playground

What did preschoolers' play look like on the playground? When data were collapsed across the four playgrounds for the social play categories, the rank ordering of frequency of Parten's categories was very similar in this study to that of research conducted indoors (Rubin et al, 1978). The only exception was that the frequencies of unoccupied play and onlooker activity were comparable in this study, whereas onlooker play occurred more frequently than unoccupied play in Rubin et al.'s (1978) study. In fact, unoccupied play occurred twice as often in this study as in Rubin et al.'s study. In comparison to Parten's (1932) and Rubin et al.'s (1976) indoor research, nonplay, defined as the sum of unoccupied and onlooker frequencies, occurred more frequently in the present study.

In Hart and Sheehan's (1986) study of preschoolers' playground behavior, the proportion of nonplay to total play was

also higher than it was in Parten's (1932) and Rubin et al.'s (1978) studies. However, the proportion of unoccupied play was not as high in Hart & Sheehan's study as it was in this study. Perhaps the spatially larger environment of the outdoor playground results in children displaying more nonplay and transitional type of behaviors as they move from one activity to another.

Among the activity categories, motor play and dialogue were by far the most frequently observed. In contrast, fine motor play (functional), constructive play, fantasy play, and games were observed fairly infrequently (especially games). Constructive play occurred less frequently and fantasy play more frequently in this outdoor study than in previous indoor studies (Rubin et al., 1976, 1978).

In their study of preschool behavior on the playground, Hart and Sheehan (1986) observed similarly high levels of motor play. When comparing preschoolers' play indoors and outside, Henninger (1985) found significantly higher means of functional play and lower means of constructive play outdoors than indoors. Differences between indoor and outdoor activities could be due to the fact that the larger open areas found outdoors provide a setting for play involving bigger movements, vehicles, balls, etc. and thus higher levels of motor play and lower levels of other activities such as constructive play.

In this study aggression was observed very infrequently. Such infrequency in occurrence has also been reported in other

studies of this age group (Holmberg, 1980; Huston-Stein, Friedrich-Cofer, & Susman, 1977; Smith & Green, 1975).

There was evidence for an increase in the complexity of behavior with age in the present data. That is, rates of associative play, fantasy play, and games were positively correlated with age. Other studies of play (Hetherington et al., 1979, Parten, 1932; Rubin & Krasnor, 1980; Rubin et al., 1976; 1978) have found similar relationships between age and type of play engaged in.

Type of social participation play was related to type of activity in expected ways. As in Rubin et al.'s study (1978), functional play decreased and fantasy play increased as associative and cooperative play increased, respectively.

Playground Preferences and Behavior in Different Play Areas.

By examining play in four different daycare centres, this study was able to determine whether preferences for and activities in different types of play areas were replicated across playgrounds. Across the four playgrounds, a high proportion of time was spent playing in larger open areas (grass, sand, pavement). High proportions of time were also spent on swings. Other studies have reported that elementary school-aged children also spent a great deal of time on structures allowing for noneffort movement such as swinging and sliding (Heusser et al., 1986; Hole, 1966; Naylor, 1985; Peterson et al., 1973; Sanoff, 1986).

The encouragement of specific behaviors by the four general types of play areas was replicated across playgrounds. Significantly higher rates of unoccupied play were found on the pavement and in sand than in private areas and on apparatuses. The larger, more open areas, specifically the pavement and sand areas, tended to be lower in social density than the smaller, more enclosed areas, such as private areas and the play structures. Research on the association between social density and level of social participation is equivocal (Hutt & Vassey, 1966; Loo, 1973; Loo & Kennelly, 1979; McGrew, 1970; Prieser, 1972). However, Prescott (1981) has argued that factors such as the shape and organization of a play area and amount of playground equipment combine with density to influence behavior. Thus, the reasons for higher levels of nonsocial play on pavement and in sand may have been both due to the combination of physical features such as size and openness and to social features such as having fewer children available to interact with.

Differences in environmental effects across playgrounds were also found. Significant differences were found across playgrounds in the amounts of solitary and cooperative play elicited by play structures. Solitary play was highest on the equipment of Playground 1. Cooperative play was higher on the equipment of Playground 2 than on that of Playgrounds 1 and 3 and higher on the equipment of Playground 4 than on that of Playground 1. Very high levels of solitary play were found on the swings of Playground 1 and therefore, the swings were

responsible for higher levels of overall solitary play on this playground's play equipment. Because Playground 1's swings constituted a separate piece of equipment and were not part of the activity flow of a second large multifunctional structure, and because individual swings were spaced far from one another, socially isolated types of activities may have been encouraged by this particular piece of equipment. Indeed, Bruya (1985) found that when separate structures were unified, social interaction increased.

Inspection of the levels of cooperative play on the separate parts of the equipment revealed that very high levels of this type of play took place on the tire swings of Playgrounds 2 and 4. Playgrounds 1 and 3 had no tire swings and, incidently, not only had lower levels of cooperative play on all equipment but had lower levels of cooperative play for the playground as a whole. Ledingham and Chappus (1986) also found an association between cooperative play and tire swings. Because of their size and weight, tire swings, unlike traditional swings, can seat more than one individual and require assistance to use. Traditional swings, by contrast, which this study found to yield very low levels of cooperative play, are more easily used alone. Thus, size of equipment may be directly related to how much cooperation it generates.

Differences also existed across playgrounds in the levels of fine motor and motor play in each type of play area. On Playground 1, significantly higher levels of fine motor play

were found in sand areas than in the rest of the play areas and significantly higher levels were found on pavement than in private areas or on play structures. Playground 4 had significantly higher levels of fine motor play on the sand than on its pavement or private areas. Other research conducted both indoors and outdoors has also found that sand promotes fine motor play (Cooper Marcus, 1974; Hendrickson et al., 1981; Johnson & Erschler, 1981; Parten 1933; Rubin, 1977a, 1977b).

On Playgrounds 1 and 2 significantly higher levels of motor play occurred on play structures than in any other play areas. On Playground 3, significantly higher rates of motor play were produced on play structures than in sand or private areas and significantly higher levels on pavement than private areas. On Playground 4, significantly higher levels of motor play were found on play structures and private areas than in sand. On the whole, consistent with the findings of Ledingham and Chappus (1986), play structures encouraged high levels of motor play. Pavement also produced high rates of motor play. The high incidence of motor play in the private area of Playground 4 can perhaps be explained by the fact that this area was an integral part of the play structure where children could climb onto the play structure from the private area or vice versa.

Although significant localization was not found for fantasy play, examination of means indicated that, with the exception of Playground 4, fantasy play was highest in private areas. Fantasy play was higher in the private areas of Playground 3 than in the

private areas of the other playgrounds and lowest in the private area of Playground 4. Unique to two of Playground 3's private areas was a combination of a realistic structure (an area resembling a house), a high degree of encapsulation, and separateness from other equipment, and higher levels of fantasy play were found in these two private areas than in the other two quite different private areas of Playground 3. Fields (reported in Fein, 1981), McLoyd (1983), and Olszewski and Fuson (1982) have also found that preschoolers engage in more dramatic play with highly structured objects such as tea sets and dolls than with less structured objects such as pipe-cleaners. The separateness of private areas and their degree of encapsulation also appears important, since the lowest levels of fantasy play was found on Playground 4's private area, an area which resembled a house but was minimally encapsulated; since it could be entered from the play structure, it perhaps allowed for intrusions in ongoing play.

Although, the means for onlooker play, aggression, constructive play, and games were not statistically analyzed, inspection of these data suggested some interesting relationships between these behaviors and play areas. Onlooker play was generally low on the play structures and was also low in the private areas of Playgrounds 3 and 4. Play structures and private areas were smaller and more socially dense than sand or pavement, and it may be that when children used these play areas it was more difficult to be an observer without interacting with

peers. Similar to the findings of outdoor research (Beth-Halachmy & Thayer, 1978; Cooper Marcus, 1974), constructive play was highest in sand areas.

Although aggression was not consistently associated with any of the four general play areas, inspection of the means for the spatial-functional areas showed a tendency for higher levels of aggression in some of the larger, more open, and less socially dense areas, including the grass. Research has been equivocal with respect to rates of aggression and level of social density (Hutt & Vaisey, 1966; Loo, 1972). Perhaps the softness of sand and grass rendered them "safer" places for vigorous physical activity. In fact, studies have shown that grass pulls for rough and tumble play (Beth-Halachmy & Thayer, 1978; Cooper Marcus, 1975; Pellegrini, 1989), an activity similar to aggression at the level of motor patterns.

Internalizing and Externalizing Behaviors and Use of Space

This study investigated the usefulness of a mediational model of environmental effects which acknowledged the influence of the individual in determining which environments he or she will experience and in turn be affected by. However, no support was found for the hypothesis that use of playground space would differ as a function of internalizing and externalizing behaviors.

Small cell sizes may explain why these groups did not differ significantly on the use of space variables. Indeed, examination

of the means for the use of space variables shows that they were generally in the hypothesized directions. More specifically, children scoring low on the IP-AW factor (high on internalizing behaviors) did not play in as many areas as children scoring average or high on this factor. Moreover, significant positive correlations were found between the IP-AW factor score and extensiveness of play.

Apart from small sample sizes, lack of support for the predictions may have been due to the way in which intensiveness of play and density coefficients of areas were calculated. Intensiveness of play was defined as the proportion of time spent in a child's most preferred play area. Perhaps this measure of intensiveness was too conservative; if a more lenient measure had been employed (eg. proportion of time in top 25% of preferred areas), differences between groups might have been found.

To determine the social density of an area, the mean proportion of play in each area was divided by the square feet of the area. A tertial split was performed to categorize areas as high, moderate or low in density. Since an average social density coefficient was calculated for each area, the density of an area may not have been constant at all times. Moreover, as it turned out, social density and size of an area were confounded: larger areas were consistently less dense than smaller areas.

Since low IP-AW scorers are characterized as withdrawn and unassertive, it was expected that they would spend more time where there were fewer peers (low density areas) and less time in

areas where there were more peers (i.e. moderate and high density areas) where it might prove necessary to use assertive directed requests to obtain objects. However, the low IP-AW scorers tended to spend more time in high social density areas than high or average IP-AW scorers, who tended to spend more time in low density areas. Possibly low IP-AW scorers played in an area designated as "high" in social density at times when it was less crowded. Perhaps the small size of high density areas attracted low IP-AW scorers, whereas the openness and large size of low density areas inhibited them from playing there. High IP-AW scorers (the more socially active children) may have played in the parts of low density areas that were higher in social density. Socially active children may also have found that larger spaces were necessary for some forms of social play and that larger spaces offered out-of-the-way areas for quiet social interaction.

It was expected that low CC-AD scorers (aggressive-disruptive children) would congregate in high social density areas and thus play more intensively and cover less area on the playground. Although differences were not significant, low CC-AD scorers tended to spend less time than other groups in moderately dense areas and more time in high and low density areas. What is interesting is that high levels of aggression occurred in some of the low-density areas. Since aggressive children have been found to focus on aggressive or hostile cues in their environment (Dodge & Newman, 1981; Gouze, 1987), low CC-AD scorers may have

been attracted to low-density areas by aggressive acts observed in these areas.

In summary, low levels of power, the conservativeness of the measure of intensiveness of play, and the confounding of the density and size of areas may all have contributed to a lack of significant differences between high, average, and low IP-AW and CC-AD scorers in their use of space. A final methodological factor which may have affected results concerns the way in which externalizing and internalizing behaviors were measured. Generally, observational measures did not correlate strongly with the KSCS, calling into question the validity of the teacher ratings. Low and average internalizers did engage in significantly more associative play than high internalizers, and higher IP-AW scorers had higher frequencies of associative and cooperative behaviors and lower frequencies of unoccupied play. However, there was no significant relationship between IP-AW scores and either solitary or onlooker play, activities associated with social isolation.

High and average externalizers were found to have significantly higher proportions of associative play and dialogue than low externalizers. This was expected given that aggression in preschoolers correlates with frequency of group play (Cummings et al., 1986; Rubin & Clark, 1984; Stein et al., 1972) Correlations between the CC-AD score and observed aggression were in the expected negative direction, although not significant. Given the very infrequent observation of aggression and the very

small range of scores on this variable, however, its correlation with CC-AD scores may have been attenuated. Moreover, observed aggression included only physical aggression. Perhaps the inclusion of verbal aggression would have strengthened the relationship between CC-AD scores and observed aggression.

An unanticipated finding was a negative correlation between the CC-AD score and observed cooperative play. It was unexpected that children who teachers rated as disruptive would be more frequently observed in organized group activity involving a common goal and division of labour. Research suggests, however, that children may act differently with teachers than they do with peers and that they are more likely to engage in cooperative play with peers than with teachers (Ledingham & Younger, 1985; Whiting & Whiting, 1975).

In short, the correlations between the KSCS factor scores and the observational measures may indicate that a better measure of internalizing and externalizing behaviors could have been found. Moreover, the positive pole of the CC-AD factor involves a measure of compliance. One needs to question whether compliance is a positive alternative to externalizing/acting out behavior. In fact, Crombie and Gold (1989) found that in a group of preschoolers, high levels of compliance were negatively correlated with problem solving.

For future measurements of externalizing and internalizing behaviors in preschool children, a combination of different assessment techniques and the use of multiple raters are

recommended. Research suggests that characteristics of the rater such as age influence the peers' assessments (Younger & Boyko, 1987; Younger & Piccinin, 1989). Before fourth grade, children seem to conceptualize others in terms of concrete, situation-specific, observable behaviors (Barenboim, 1984; Rholes & Ruble, 1984) and may not be able to respond adequately to withdrawal items on a questionnaire because of their abstract, non-behavioral nature (Younger, Schneider, & Daniels, 1991). Teachers on the other hand may not be able to identify well-behaved nondisruptive children who are withdrawn or apathetic with peers (Rubin, LeMare, & Lollis, 1989). For assessing social withdrawal in preschool children, behavioral observations, despite being time consuming, may provide the most accurate measure. For assessing aggressive children, however, peers may be appropriate even at preschool age. Moreover, since aggression is elicited almost entirely by peers, more direct experience with the behavior should lead to more accurate portrayals of it (Ledingham & Younger, 1985).

The instrument used here for teacher ratings was designed to measure both positive and negative aspects of social involvement on a single scale. If positive and negative aspects of internalizing and externalizing patterns had been measured separately, it might have been possible to explore in a more sensitive fashion how each aspect contributed to use of space. Perhaps withdrawal and unassertiveness influence use of space

differently than rejection which does not correlate with withdrawal at the preschool age (Rubin, 1982a).

Sex Differences in Use of Playground Space

No significant sex differences were found in total use of each of the four general play areas (pavement, sand, play structures, private areas), total use of areas close to the school and far from the school, or extensiveness and intensiveness of play. Given that males' and females' social and cognitive play did not differ significantly, it is perhaps understandable that no sex differences existed in preference for pavement, sand, apparatus, and private areas.

Despite the lack of significant sex differences, it is interesting that the means for proportion of time spent in areas far from the school were always higher for males than for females (although for Playground 2, the difference was minimal) and that, on all four playgrounds, areas away from the school were low to moderate with respect to teacher interaction rates. On Playgrounds 1 and 4, where females spent more time close to the school than males, areas close to the school were high in teacher interaction. On Playgrounds 2 and 3, where males spent more time playing close to the school than females, areas close to the school ranged from low to high in teacher presence. Thus, males and females' choice of play area may have been dependent on teacher interaction. Indoor research suggests that more females more frequently stay in closer proximity to teachers than do

males and receive more attention when close to the teacher, whereas males receive more attention for participating in activities that are not in the vicinity of teachers (Fagot, 1978; Serbin, O'Leary, Kent, & Tonik, 1973). Moreover, teachers provide relatively less supervision of male-preferred activities during free play (Fagot & Patterson, 1969). Whether characteristics of the child such as greater noisiness in males influence adults to direct them to play further away (Waldrop & Halverson, 1975,) or whether teachers' attitudes towards gender supports differential patterns of reinforcement, it appears that in this study males' and females' use of space may have been associated with aspects of their social environment.

Perhaps significant sex differences in choice of preferred play area far and close to the school would have been more strongly demonstrated if all areas far from the school had been low in teacher interaction and all areas close to the school had been high. Alternatively, it may be that differential reinforcement for playing close to teachers increases with age. Studies have shown that parents are equally protective with respect to how far they allow preschool males and females to play from home, whereas, with older children, parents become more strict with females (Coates & Bussard, 1974; Hart, 1978; Newson & Newson, 1976). Significant sex differences in the amount of time elementary school-aged children spend close to and far from the school (Lever, 1976) could also be a function of parental attitudes reinforcing patterns encouraged by teachers.

The ways in which extensiveness and intensiveness of play were measured may also have been responsible for failure to find significant sex differences. The large variability in sizes of areas meant that although one child might have spent the same amount of time as another in a most preferred play area, whether his or her confinement in space was more extreme than the other child's ultimately depended on the size of the most preferred area and whether he or she covered all of the play space in the area. Thus, the measures of extensiveness and intensiveness of play did not index amount of space covered.

Harper and Sanders (1975) found significant sex differences not only in the number of total areas covered but also in the amount of open space covered. If amount of space played in had been examined in this study, perhaps sex differences would have emerged. However, it is important to note that in Harper and Sander's (1975) study males and females could choose to play indoors or out. Since males preferred the outdoor environment, results were confounded with amount of time played outdoors. If preference had been controlled for, sex differences might not have been found in the use of play space in this study either.

Conclusions

By using an observational coding scheme which reflects important preschool behaviors and which has been widely used, this study was able to make a comprehensive analysis of outdoor

play and to compare playground data to normative data on preschoolers' indoor play patterns. The data suggest that for preschoolers, nonplay (unoccupied and onlooker activity) and fantasy play occur more frequently outdoors than indoors whereas constructive play occurs less frequently outdoors than indoors.

The classification of the playground in terms of four general types of play areas appears useful for studying overall preferences. However, it is clear with respect to environmental effects that variants within these types of areas are also important. For example, play structures which contain tire swings seem to encourage more cooperative play than structures which do not contain this type of swing. Further efforts at classifying playground environments should be made.

Results from this study, in conjunction with those of other investigations (Cooper Marcus, 1974; Johnson & Erschler, 1981; Parten, 1933, Rubin, 1977a, 1977b), provide preschool educators with information on the activities associated with different features of the playground. Playground sand appears to encourage fine motor and constructive play. Play structures promote motor play and those with tire swings, encourage cooperative play. Although further empirical verification is necessary, autonomous, highly structured and highly encapsulated areas appear to produce higher amounts of fantasy play than enclosed areas which do not have these characteristics. Since, research suggests that fine motor play consolidates cognitive schemas (Piaget, 1962), fantasy play increases divergent thinking (Dansky, 1980; Li, 1978; Pepler

& Ross, 1981), and social play teaches social skills (Burns & Brainerd, 1979; Iannotti, 1978, Rosen, 1974), it is important to include play areas that elicit these behaviors.

One needs to be aware that social factors which were not monitored in this study may have influenced the behavioral effects of play areas and contributed to behavioral differences across playgrounds. First, teachers' conceptions of their role, their view of how children learn, and the autonomy they give to children may all influence the way children use various parts of their environment (Huston-Stein et al., 1977; Verma & Peters, 1975). Second, characteristics of playmates such as familiarity, age, and sex (Doyle, Connolly, & Rivest, 1980; Goldman, 1981; Jacklin & Maccoby, 1978; Lougee, Grueneich, & Hartup, 1977; Pelegrinni & Perlmutter, 1989) affect behavior and may also have influenced what occurred in certain play areas.

Behavioral differences across play areas may have also resulted from differences in the types of children who played in these areas. For example, high levels of solitary play on traditional swings may have been due to the fact that withdrawn children chose to play in that area rather than due to the material itself. This hypothesis deserves further attention.

Significant differences were not found in the way children differing on sex or social involvement used their playground space, or in the time they spent in play areas. However, issues of power and the way in which certain dependent variables were defined may have contributed to this. Future studies should

examine not only which environments individuals choose to experience and in turn be affected by, but also whether individuals use the same environment differently and in this way determine the nature of environmental effects.

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Appendix A

Parental Information Letter and Consent Form

September 1987,

Dear Parents,

Dr. Jane Ledingham of the University of Ottawa and I are conducting a study to look at how children's play is affected by the playground equipment at their day care centre and we hope that you will allow your child to participate. This project will involve our observing the play of all children at the four day cares over a period of a few weeks and having a day care worker complete a questionnaire to describe how each child gets along with other children. These observations will not interfere with the play of the children and any child who does not wish to be observed will not be included in the study. Results of the study will be described only for groups of children and all information about any specific child will remain confidential even from the day care staff.

We hope that this study will help us to design better playgrounds for young children and will send you and the day cares a summary of what we have learned from the project. If you agree to let your child participate, please sign at the bottom of this letter and return it to the staff of the day care centre. If you have any questions, please feel free to contact me at 565-2249 or Dr. Ledingham at 564-2463. We thank you for your cooperation.

Yours sincerely,

Mary Rallis
Doctoral student in
Psychology

(letter continues)

PLEASE RETURN THIS FORM AS SOON AS POSSIBLE

I have read and understand the request for my son/daughter to participate in this study of how children's play is affected by playground equipment.

I give permission for my child to participate.

I do not give permission for my child to participate.

 Child's name

 Signature of Parent

 Child's birthdate

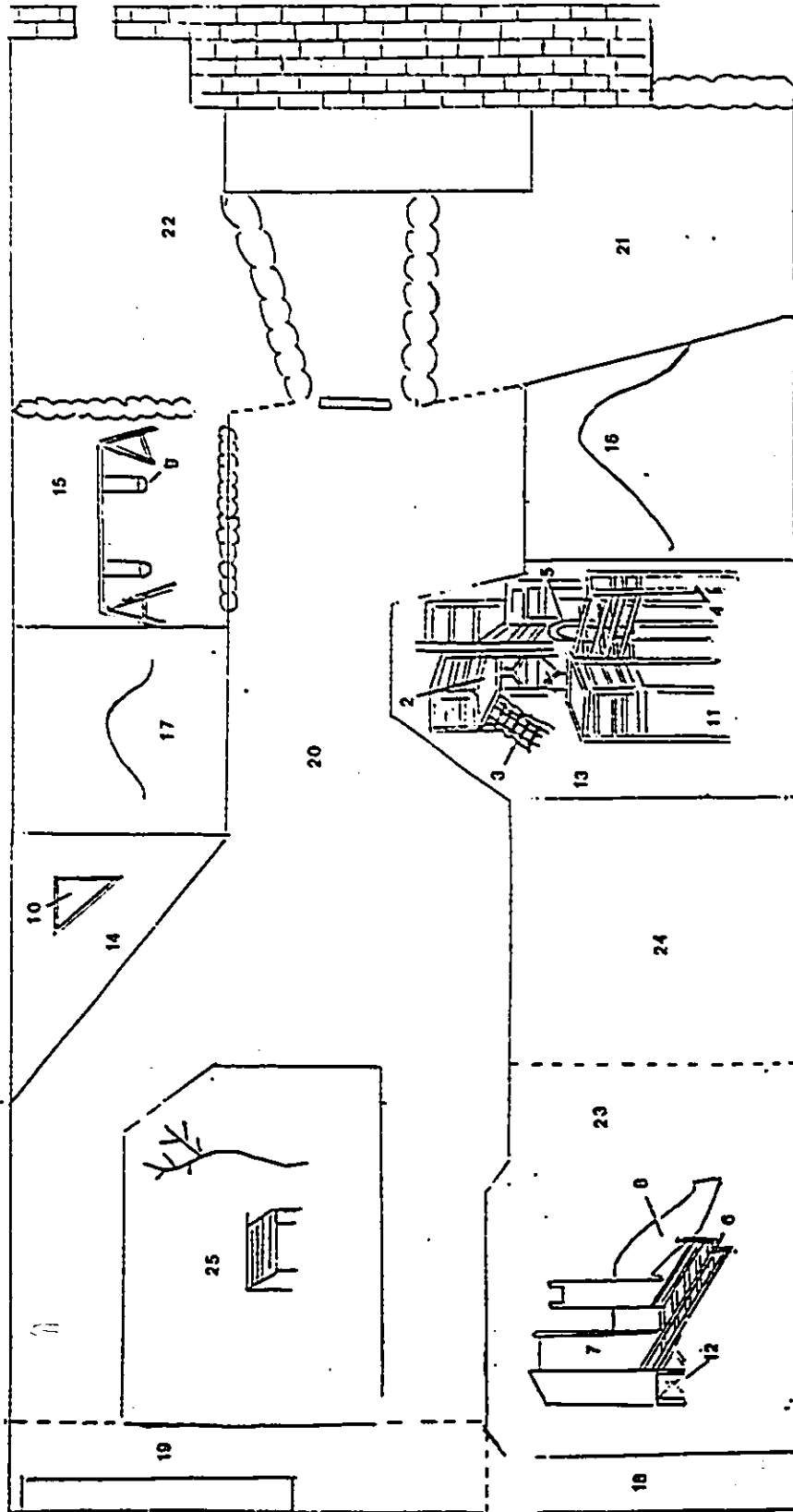
 Date

 Tel.

*Note that the parental letter and consent form were printed on University of Ottawa letterhead paper, and were originally on a single page.

Appendix B
Playground Maps

Playground 1



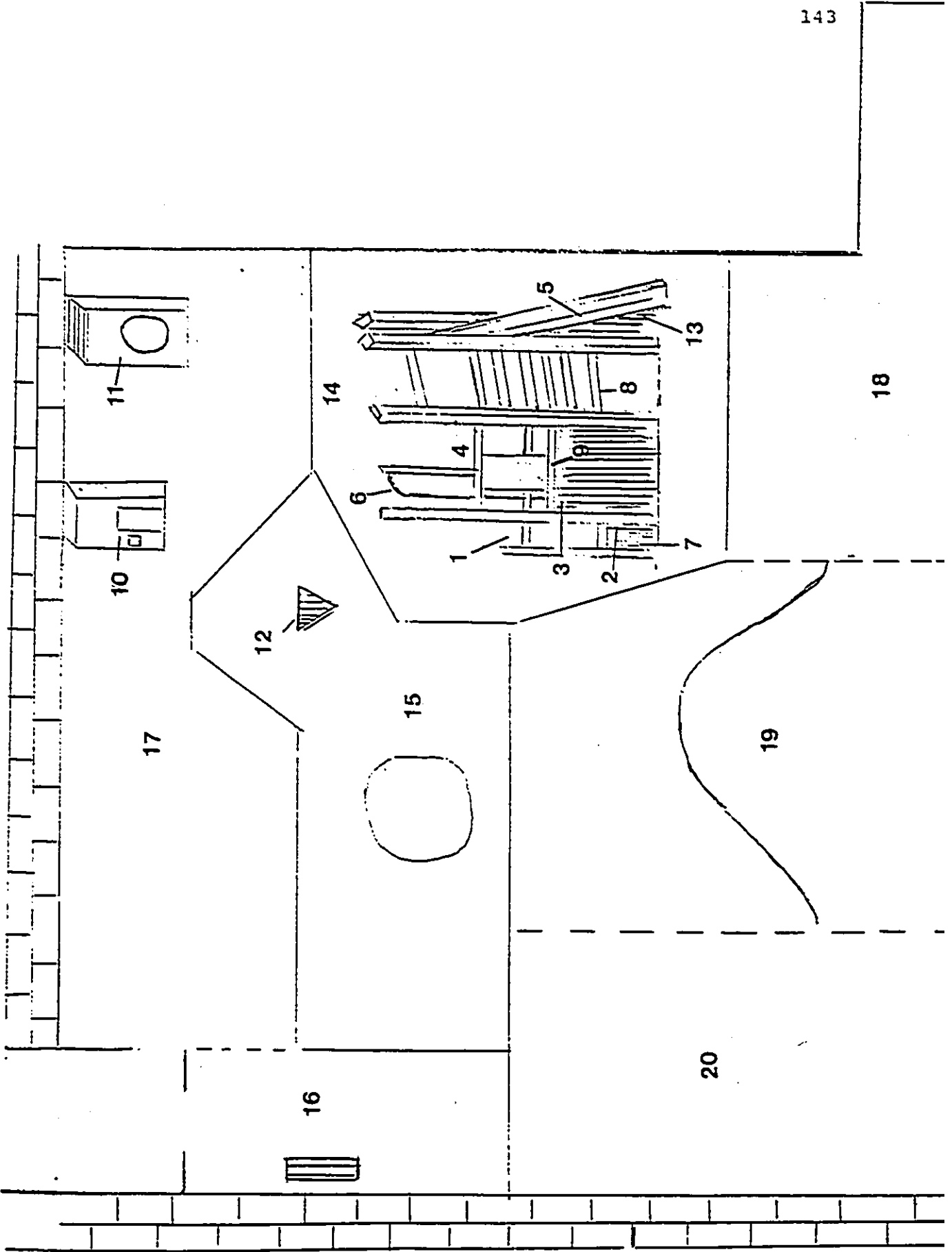
Legend: Playground 1

- 1 -Stairs
- 2 -Top of structure
- 3 -Climber
- 4 -Bench
- 5 -Firepole
- 6 -Stairs
- 7 -Top of structure
- 8 -Slide
- 9 -Swings
- 10-Table in sand
- 11- Sand under structure
- 12-Enclosed area (private area)
- 13-Sand around structure
- 14-Sand box
- 15-Sand around swings
- 16-Knoll
- 17-Knoll
- 18-Pavement (categorized as far from the school)
- 19-Pavement (categorized as far from the school)
- 20-Pavement
- 21-Pavement (categorized as close to the school)
- 22-Pavement (categorized as close to the school)
- 23-Grass
- 24-Grass
- 25-Grass

Legend: Playground 2

- 1-Stairs
- 2-Top of structure
- 3-Slide
- 4-Traditional swings
- 5-Tire swing
- 6-Net climber
- 7-Cylinder climber
- 8-Picnic table
- 9-Enclosed area (private area)
- 10-Sand around structure (categorized as close to the school)
- 11-Sand box
- 12-Sand around structure
- 13-Sand around structure
- 14-Sand around structure
- 15-Pavement (categorized as far from the school)
- 16-Pavement
- 17-Pavement (categorized as close to the school)
- 18-Grass
- 19-Grass

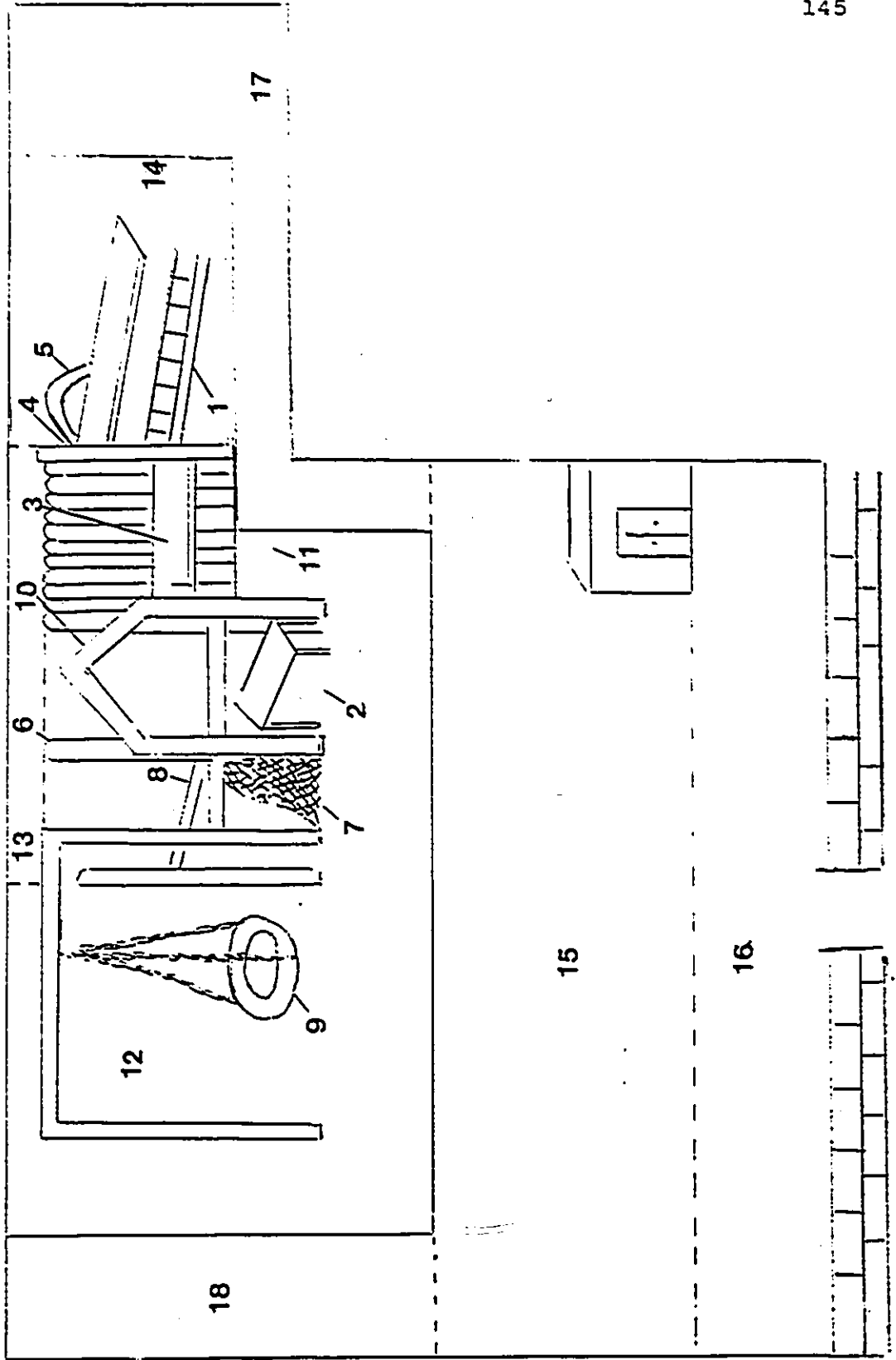
Playground 3



Legend: Playground 3

- 1-Stairs
- 2-Enclosed area
- 3-Enclosed area (Areas 2 and 3, combined, constitute a private area)
- 4-Top of structure
- 5-Slide
- 6-Firepole
- 7-Horizontal Bar
- 8-Climber
- 9-Ledge
- 10-House-like structure (private area/categorized as close to the school)
- 11-House-like structure (private area/categorized as close to the school)
- 12-Table in sand
- 13-Sand under structure
- 14-Sand around structure
- 15-Sand
- 16-Pavement
- 17-Pavement (categorized as close to the school)
- 18-Grass (categorized as far from the school)
- 19-Grass
- 20-Grass

Playground 4



Legend: Playground 4

- 1 -Stairs
- 2 -House-like structure (private area)
- 3 -Top of structure
- 4 -Top of structure
- 5 -Slide
- 6 -Firepole
- 7 -Net climber
- 8 -Horizontal bar
- 9 -Tire swing
- 10-Ledge
- 11-Sand under structure
- 12-Sand
- 13-Sand around structure (categorized as far from the school)
- 14-Sand around structure (categorized as far from the school)
- 15-Pavement (categorized as close to the school)
- 16-Pavement
- 17-Pavement
- 18-Pavement

Appendix C

Kohn Social Competence Scale

CHILD'S NAME _____ RATED BY _____
 CHILD'S AGE _____ head teacher
 ROOM OR GROUP _____ asst. teacher
 _____ observer
 _____ other

73 ITEM SOCIAL COMPETENCE SCALE
 (for full day preschool programs)

THIS SCALE IS DESIGNED TO MEASURE THE DEGREE OF COMPETENCE WITH WHICH A 3-5 YEAR OLD CHILD MASTERS VARIOUS ASPECTS OF A FULL DAY PRESCHOOL PROGRAM. IT CONSISTS OF 73 STATEMENTS ABOUT A CHILD'S BEHAVIOR. YOU ARE ASKED TO RATE EACH STATEMENT IN TERMS OF THE FREQUENCY WITH WHICH YOU HAVE OBSERVED THE BEHAVIOR DURING THE MOST RECENT WEEK.

THE RATINGS CONSIST OF SEVEN DIFFERENT CATEGORIES OF FREQUENCY RANGING FROM ALWAYS TO NEVER. PLEASE CIRCLE THE NUMBER (1, 2, 3, 4, 5, 6, 7) WHICH CORRESPONDS TO THE CATEGORY WHICH, IN YOUR JUDGEMENT, IS MOST DESCRIPTIVE OF THIS CHILD'S BEHAVIOR FOR THE MOST RECENT WEEK.

PLEASE DO NOT CONSULT WITH ANYONE CONCERNING YOUR RATINGS. WE ARE INTERESTED IN RESPONSES WHICH ARE BASED ON YOUR KNOWLEDGE OF AND EXPERIENCE WITH THE CHILD.

THESE RECORDS ARE BEING USED AS PART OF A UNIVERSITY RESEARCH PROJECT AND ARE STRICTLY CONFIDENTIAL.

RATING INSTRUCTIONS

1. BASE YOUR RATINGS ON THE CHILD'S BEHAVIOR DURING THE MOST RECENT WEEK. CONSIDER ONLY WHAT THE CHILD DID DURING THAT TIME PERIOD AND TRY TO DISREGARD PRIOR BEHAVIOR AND ACTIONS.
2. CONSIDER EACH QUESTION INDEPENDENTLY. IT IS WELL KNOWN THAT CHILDREN MAY EXHIBIT SEEMINGLY CONTRADICTIONARY BEHAVIOR.
3. BASE YOUR RATINGS ON HOW YOU HAVE OBSERVED THE CHILD FUNCTIONING IN THE CLASSROOM.
4. SOME ITEMS CONTAIN A NUMBER OF SPECIFIC BEHAVIORS WHICH ARE ONLY SLIGHTLY DIFFERENT FROM EACH OTHER. DO NOT HESITATE TO MAKE A RATING EVEN THOUGH THE CHILD DOES NOT EXHIBIT ALL OF SPECIFIC BEHAVIORS.
5. ANSWER EVERY ITEM. DO NOT LEAVE ANY BLANKS.
6. DO NOT HESITATE TO USE THE EXTREME POINTS WHERE APPROPRIATE.

SOCIAL COMPETENCE SCALE

	VERY ALWAYS	OFTEN	OFTEN	SOME- TIMES	SELDOM	HARDLY EVER	NEVER
1. Child can concentrate his emotional needs to the teacher.	1	2	3	4	5	6	7
2. Child seeks adult attention by crying.	1	2	3	4	5	6	7
3. Child needs adult aid for each step of activity.	1	2	3	4	5	6	7
4. Child is responsible for carrying out requests and directions.	1	2	3	4	5	6	7
5. Child seeks physical contact with teacher.	1	2	3	4	5	6	7
6. Child adds freely (verbally or nonverbally) to teacher's suggestions.	1	2	3	4	5	6	7
7. Child expresses open defiance against authority.	1	2	3	4	5	6	7
8. Child shies away and withdraws when approached by other children.	1	2	3	4	5	6	7
9. Child responds with <u>immediate</u> compliance to teacher's direction.	1	2	3	4	5	6	7
10. Child can be independent of adult in having ideas about or planning activities.	1	2	3	4	5	6	7
11. Child frowns, shrugs shoulders, pouts, or stamps foot when suggestion is made by teacher.	1	2	3	4	5	6	7
12. Child can be independent of adult in overcoming difficulties with other children or activities.	1	2	3	4	5	6	7
13. Child needs excessive praise and encouragement in order to participate in activities.	1	2	3	4	5	6	7
14. Other children seem unwilling to play with this child.	1	2	3	4	5	6	7

	VERY ALWAYS	OFTEN	SOME- OFTEN	TIMES	HARDLY SELDOM	EVER	NEVER
	1	2	3	4	5	6	7
15. Child is unwilling to carry out reasonable suggestions from teacher even when having difficulty.	1	2	3	4	5	6	7
16. Child feels comfortable enough with other children to be able to express his own desires and opinions.	1	2	3	4	5	6	7
17. Child hits teacher.	1	2	3	4	5	6	7
18. Child is fearful in approaching other children.	1	2	3	4	5	6	7
19. Child can accept teacher's ideas and suggestions for play or ways of playing.	1	2	3	4	5	6	7
20. Child gets willing cooperation from most other children.	1	2	3	4	5	6	7
21. Child needs teacher's attention at nap times.	1	2	3	4	5	6	7
22. Child gives the appearance of complying with teacher's suggestions but does not do suggested activity.	1	2	3	4	5	6	7
23. Child is bossed and dominated by other children.	1	2	3	4	5	6	7
24. Child's ideas have impact on many children in the classroom.	1	2	3	4	5	6	7
25. Child rebels physically, for example, has temper tantrums, hits, kicks, etc.	1	2	3	4	5	6	7
26. Child easily gets attention of other children.	1	2	3	4	5	6	7
27. Child needs special attention at lunch or snack time.	1	2	3	4	5	6	7
28. Child has difficulty defending his own rights with other children.	1	2	3	4	5	6	7
29. Child cooperates with rules and regulations.	1	2	3	4	5	6	7

	VERY ALWAYS	OFTEN	SOME- OFTEN	TIMES	HARDLY SELDOM	EVER	NEVER
	1	2	3	4	5	6	7
30. Child dawdles when required to do something.	1	2	3	4	5	6	7
31. In play with other children, child can shift between leading and following situation.	1	2	3	4	5	6	7
32. Child reacts negatively to teacher's ideas and suggestions for activities.	1	2	3	4	5	6	7
33. Child is unable to occupy himself without other children directing activities for him.	1	2	3	4	5	6	7
34. Child is willing to turn to other children for help and assistance.	1	2	3	4	5	6	7
35. Child actively defies teacher's rules and regulations.	1	2	3	4	5	6	7
36. Child can give ideas to other children as well as go along with their ideas.	1	2	3	4	5	6	7
37. When making a change from one activity to another, child resists entering the new activity.	1	2	3	4	5	6	7
38. Child appears at a loss in unstructured free play types of activities.	1	2	3	4	5	6	7
39. Child easily makes the change from one activity to another.	1	2	3	4	5	6	7
40. Child seems to enjoy both play with others and by himself.	1	2	3	4	5	6	7
41. Child is hostile or aggressive with other children, for instance pushes, taunts, bullies, etc.	1	2	3	4	5	6	7
42. Other children copy this child's ideas for play.	1	2	3	4	5	6	7
43. Child has to be a leader in order to participate in activities with other children.	1	2	3	4	5	6	7

	VERY ALWAYS	OFTEN	SOME- OFTEN	TIMES	HARDLY SELDOM	EVER	NEVER
	1	2	3	4	5	6	7
44. Child participates in a halfhearted way.	1	2	3	4	5	6	7
45. Child is a picky eater.	1	2	3	4	5	6	7
46. Child takes possession of other children's equipment without their permission.	1	2	3	4	5	6	7
47. Child demonstrates little interest in things and activities.	1	2	3	4	5	6	7
48. Child is open to the ideas and suggestions of other children.	1	2	3	4	5	6	7
49. Child is responsible in following through on routines, for example, getting dressed/undressed, washing hands etc.	1	2	3	4	5	6	7
50. Child is quarrelsome.	1	2	3	4	5	6	7
51. Child seems eager to try new things.	1	2	3	4	5	6	7
52. Child is dominating and bossy with other children.	1	2	3	4	5	6	7
53. Child spends time sitting around, looking around or wandering around aimlessly.	1	2	3	4	5	6	7
54. Child can remain alert and interested in an activity.	1	2	3	4	5	6	7
55. Child prevents other children from carrying out routines.	1	2	3	4	5	6	7
56. Child succeeds in getting others interested in what he is doing.	1	2	3	4	5	6	7
57. Child has difficulty resting during nap time.	1	2	3	4	5	6	7
58. Child shows interest in only a few types of things.	1	2	3	4	5	6	7
59. Child puts things away carefully.	1	2	3	4	5	6	7

	VERY ALWAYS	OFTEN	OFTEN	SOME- TIMES	SELDOM	HARDLY EVER	NEVER
	1	2	3	4	5	6	7
60. Child is unwilling to play with other children except on his own terms.	1	2	3	4	5	6	7
61. Child responds well when the activity is planned or directed by the teacher.	1	2	3	4	5	6	7
62. Child disrupts activities of others.	1	2	3	4	5	6	7
63. Child easily loses interest and floats from one activity to another.	1	2	3	4	5	6	7
64. Child can participate actively in structured activities as well as free play type of activities.	1	2	3	4	5	6	7
65. Child has difficulty leaving school at end of day.	1	2	3	4	5	6	7
66. Child has difficulty falling asleep during naptime.	1	2	3	4	5	6	7
67. Child easily gives up when confronted with a difficulty.	1	2	3	4	5	6	7
68. Child shows enthusiasm about work or play.	1	2	3	4	5	6	7
69. Child has trouble keeping to the rules of the game.	1	2	3	4	5	6	7
70. Child cries during naptime.	1	2	3	4	5	6	7
71. Child seems to be at a loss when first coming into the classroom.	1	2	3	4	5	6	7
72. Child acts silly at lunch table, for example, giggles, throws food, shrieks.	1	2	3	4	5	6	7
73. Child resists going along with the ideas of other children.	1	2	3	4	5	6	7

Appendix D

Observational CategoriesSocial Participation Categories

Unoccupied (U) -The child is engaged in no activity but occupies him/herself with watching anything that happens to be of momentary interest. When there is nothing exciting taking place, he/she plays with his/her own body, just stands, walks around slowly, follows the teacher or sits in one spot glancing around.

Solitary (S) -The child plays alone and independently with toys that are different from those used by the children within speaking distance (approximately within eight feet) and makes no effort to get close to other children. He/she pursues his/her own activity without reference to what others are doing.

Onlooker (O) -The child watches the other children play. This type differs from unoccupied in that the onlooker is definitely observing particular groups of children rather than anything that happens to be exciting. To code this category the child needs to be within speaking distance of the group (approximately within eight feet) so that he/she can see and hear everything that is going on.

Parallel (P) -The child plays independently but with toys that are like those which the children around him are using. However, he/she plays beside rather than with the other children. He/she does not try to influence the activity of the children near him/her nor attempt to control the coming or going of children in the group. To code this category, the child needs to be within eight feet of another child.

Associative (A) -The child play with other children. The conversation concerns the common activity; there is a borrowing and loaning of play materials; following one another with trains or wagons; mild attempts to control which children may or may not play in the group. All the members engage in similar if not identical activity; there is no division of labour, and no organization of the activity of several individuals around any material, goal, or product, The children do not subordinate their individual interests to that of the group; instead each child acts as he wishes.

Cooperative (C) -The child plays in a group that is organized for the purpose of making some material product, or of striving to attain some competitive goal, or of dramatizing a situation of adult and group life, or of playing formal games. There is a marked sense of belonging or of not belonging to the group. The goal as well as the method of attaining it necessitates a division of labour, taking of different roles by various group

members and the organization of activity so that the efforts of one child are supplemented by those of another.

Aggression Categories

Aggressed Against (OAg) - The child is the target of another person's push, kick, or hit, or has his/her activity interfered with by another person.

Aggression Initiated (AgI) -The child slaps, pushes, kicks, bites, hits, pulls at, pokes, pinches, or uses an object to strike another person when that person did not aggress against the target child or a child with him/her in the last five seconds. Any interferences with activities of another person is also coded as aggression.

Retaliatory Aggression (AgR) -The child slaps, pushes, hits, pulls at, pokes, pinches, or uses an object to strike another, or interferes with the activities of another person who aggressed against him/her or a person near him/her in the last five seconds.

Activity Categories

Fine Motor (FM) -The child is engaged in a repetitive motor or vocal behavior. If the environment is involved, the child uses the same piece of environment over and over again without changing it in any way or creating something new. For example, a child repeatedly pats the sand near his/her foot. The vocal behavior does not include coherent speech directed towards another child.

Motor (M) -The child is moving his/her arms, jumping or moving his/her body in motions greater than one foot in magnitude or is manipulating an object. If his/her motor behavior is repetitive, FM is coded.

Dialogue (D) -The child is involved in a conversation with one or more persons. Either the target child or a peer is talking. Vocal also includes situations in which the target child talks to another child and does not receive a response. If the dialogue in the context of a role-play or a game, F(fantasy) or G(games) is coded.

Constructive (C) -The child manipulates the environment or objects to create something. Unlike fine motor play, the same action is not repeated. Instead, there a sequence of actions. For example, in making a hole in the sand, a child reaches deeper and deeper into the sand as he/she digs.

Fantasy (F) -The child assumes the role of some character or he/she imagines that an object has the characteristics of some other object. For example, a stick becomes a car.

Games (G) -The child is engaged in a formal game or play involving rules. For example, hide and seek, games of chase.

Appendix E
Intercorrelations Among Dependent Measures

Table 12

Intercorrelations Among Dependent Measures

	<u>Measures</u>							
	Uno	Sol	Onl	Par	Ass	Coo	Agg	Fmo
Uno	1.00	.17	.17	-.45**	-.28*	-.49**	-.23	.01
Sol		1.00	-.29*	-.13	-.38**	-.41**	-.22	.04
Onl			1.00	-.19	-.30*	-.22	.01	.42**
Par				1.00	-.10	-.14	.26*	.21
Ass					1.00	.06	.11	-.46**
Coo						1.00	-.01	-.15
Agg							1.00	-.04
Fmo								1.00

(table continues)

Msr	Measures									
	Uno	So1	On1	Par	Ass	Coo	Agg	FMO		
Mot	.16	.36**	-.19	.04	-.40**	-.03	-.02	-.21		
Dia	.03	-.39**	.02	-.28*	.82**	-.12	.13	-.40**		
Con	-.27*	-.05	-.05	.41**	.01	-.05	.03	.16		
Fan	-.03	-.20	.03	-.33**	.20	.29*	-.08	-.16		
Gam	-.16	-.03	-.14	.02	.09	.16	.02	-.07		
Cl	.05	.15	-.07	-.09	.14	-.18	-.10	-.06		
Far	-.18	-.13	-.17	.07	.13	.25*	-.05	-.15		
Ext	-.26*	-.31**	-.20	.06	.37**	.32**	-.03	-.08		

(table continues)

Measures

MSR	Uno	Sol	Onl	Par	Ass	Coo	Agg	FMO
Int	.31**	.02	.33**	-.18	-.20	-.22	.01	-.04
Prv	-.25*	-.00	.04	.01	.14	.08	-.18	.16
Pls	-.21	-.10	-.09	-.01	-.05	.39**	-.09	-.13
Pav	.28*	.20	-.03	-.10	-.15	-.19	-.08	-.18
San	-.31**	-.07	.05	.20	.04	.06	.17	.27*
HDn	-.25*	-.17	.07	.14	-.11	.27*	.12	.22
MDn	.39**	.15	.01	-.08	-.12	-.30*	-.12	-.17
LDn	-.24*	-.02	-.10	-.01	.25*	.10	.03	-.02

(table continues)

MSR	Measures							
	Mot	Dia	Con	Fan	Gam	Cl	Fa	Ext
Mot	1.00	-.50**	-.51**	-.61**	.01	-.18	-.00	-.15
Dia		1.00	-.04	.22	.00	.21	-.00	.19
Con			1.00	-.01	-.10	.08	-.06	-.19
Fan				1.00	-.13	.05	.17	.24*
Gam					1.00	-.05	-.03	.12
Cl						1.00	-.06	-.06
Fa							1.00	.23
Ext								1.00

(table continues)

Measures

	MSR	Mot	Dia	Con	Fan	Gam	CI	Far	Ext
Int	.17	-.06	-.09	-.11	.10	.08	-.04	-.36**	
PRV	-.29*	.07	.20	.20	-.12	.43**	-.11	.18	
P1	.33**	-.18	-.22	-.11	.01	-.48**	-.11	.18	
Pa	.22	-.09	-.10	-.03	-.07	.33**	.17	-.29*	
Sa	-.52**	.04	.49**	.25*	-.14	.06	.06	.02	
Hdn	.06	-.15	.11	-.13	-.13	-.33**	-.33**	-.05	
MDn	.15	-.05	-.06	.00	-.01	.08	-.03	-.26*	
LDn	-.24*	.22	-.02	.14	.11	.24*	.37**	.38**	

(table continues)

MSR	Measures							
	Int	Pr	Pls	Pav	San	HDn	MDn	LDn
Int	1.00	-.22	-.33**	.60**	-.30*	-.36**	.54**	-.28*
Pr		1.00	.05	-.33**	.08	.13	-.35**	.29*
Pls			1.00	-.50**	-.22	.60**	-.44**	-.10
Pav				1.00	-.34**	-.54**	.78**	-.37**
San					1.00	.17	-.28*	.18
HDn						1.00	-.59**	-.31**
MDn							1.00	-.58**
LDn								1.00

Note. Uno=Unoccupied; Sol=Solitary; Onl=Onlooker; Par=Parallel; Ass= Associative; Coo=Cooperative; Agg=Aggression; Fmo=Fine Motor; Mol=Motor; (table continues)

Dia=Dialogue; Fan=Fantasy; Gam=Games; Cl=Close to school; Far=Far from school;
Ext=Extensiveness of play; Int=Intensiveness of play; Pr/Pl/Pa/Sa/=Proportion
of time spent in private areas/on play structures/on pavement/on sand; HDn/
MDn/LDn=Proportion of time spent in high density areas/moderate density areas/
low density areas.

* $p < .05$. ** $p < .01$.

Appendix F

Table 13

Playground 1: Mean Proportion of Play in Each Play Area in Descending Order of Frequency

Area	Size (sq.ft.)	Mean
Spatial-Functional Areas		
20-Pavement	1816.6	.246
21-Pavement	772.8	.090
14-Sand	280.2	.092
25-Grass	630.8	.085
9-Swings	2.3	.064
24-Grass	478.5	.059
2-Top of structure	518.1	.057
16-Knoll	396.7	.053
13-Sand around structure	544.0	.049
10-Table in sand	8.0	.030
23-Sand	470.4	.024
19-Pavement	334.6	.023
12-Enclosed area	37.2	.019

(table continues)

Area	Size (sq.ft.)	Mean
18-Pavement	275.3	.016
3-Net Climber	22.9	.015
15-Sand around swings	272.7	.013
11-Sand under structure	108.3	.012
1-Stairs	16.0	.011
22-Pavement	870.8	.009
7-Top of structure	25.8	.007
17-Knoll	222.3	.007
8-Slide	55.2	.006
6-Stairs	61.2	.006
5-Firepole	1.6	.004
4-Bench	9.0	.002
Total pavement	4080.1	.385
Total sand	1675.6	.220
Total play structures	712.1	.172
Private area	37.2	.019

(table continues)

Note. The sum of the proportions for the spatial functional areas add up to 1. However, since Playground 1 contained grass which was not classified as a general type of play area, the sum of the proportions for the four general types of play areas does not add up to 1.

Table 14

Playground 2: Mean Proportion of Play in Each
Play Area in Descending Order of Frequency

Areas	Size (sq.ft.)	Mean
Spatial-Functional Areas		
11-Sand	29.7	.151
5-Tire swing	3.4	.130
18-Grass	488.9	.120
16-Pavement	253.5	.096
4-Traditional swings	1.3	.076
14-Sand	318.1	.062
2-Top of structure	47.5	.052
8-Picnic table	14.3	.049
15-Pavement	233.2	.046
9-Enclosed area	52.7	.041
12-Sand around structure	83.0	.038
3-Slide	40.9	.031
19-Grass	145.9	.029
17-Pavement	91.3	.030

(table continues)

Areas	Size (sq.ft.)	Mean
1-Stairs	21.5	.024
6-Net climber	26.8	.010
10-Sand around structure	208.9	.008
7-Climber	25.3	.007
13-Sand	213.1	.001
Total play structure	166.7	.330
Total sand	852.8	.260
Total pavement	578.0	.172
Private area	52.7	.041

Note. The sum of the proportions for the spatial functional areas add up to 1. However, since Playground 2 contained grass which was not classified as a general type of play area, the sum of the proportions for the four general types of play areas does not add up to 1.

Table 15

Playground 3: Mean Proportion of Play in Each
Play Area in Descending Order of Frequency

Areas	Size (sq.ft.)	Mean
Spatial-Functional Areas		
15-Sand	429.2	.173
17-Pavement	639.5	.133
14-Sand around structure	440.7	.122
19-Grass	889.4	.093
20-Grass	265.9	.090
16-Pavement	265.2	.068
18-Grass	615.0	.058
10-House-like structure	15.3	.053
1-Stairs	35.7	.038
5-Slide	28.5	.035
11-House-like structure	23.0	.031
4-Top of structure	35.8	.028
7-Horizontal Beam	.8	.017
8-Climber	21.7	.016

(table continues)

Areas	Size (sq. ft.)	Mean
3-Top of structure	18.1	.013
2-Enclosed area	14.8	.008
26-Ledge	3.2	.008
6-Firepole	2.1	.008
12-Table in sand	5.5	.004
13-Sand under structure	81.7	.001
Total sand	957.1	.299
Total pavement	904.7	.201
Total play structure	127.8	.151
Total private areas	71.2	.105

Note. The sum of the proportions for the spatial functional areas add up to 1. However, since Playground 3 contained grass which was not classified as a general type of play area, the sum of the proportions for the four general types of play areas does not add up to 1.

Table 16

Playground 4: Mean Proportion of Play in Each
Play Area in Descending Order of Frequency

Area	Size (sq.ft.)	Mean
Spatial-Functional Areas		
15-Pavement	446.4	.242
12-Sand	449.3	.152
16-Pavement	251.4	.136
9-Tire swing	4.3	.129
17-Pavement	245.6	.083
14-Sand around structure	221.9	.054
11-Sand under structure	119.6	.044
3-Top of structure	54.9	.040
18-Pavement	151.5	.029
2-Playhouse	22.6	.026
13-Sand around structure	131.3	.025
5-Slide	33.1	.013
4-Top of structure	15.5	.010

(table continues)

Areas	Size (sq.ft.)	Mean
1-Stairs	17.6	.009
7-Net climber	25.6	.004
10-Ledge	2.6	.002
6-Firepole	1.8	.001
Total pavement	1094.9	.490
Total sand	922.1	.275
Total play structure	155.4	.208
Private area	22.6	.026

Note. The sum of the proportions for the spatial functional areas and for the four general types of play areas each add up to 1.

Appendix G

Table 17

Playground 1: Rank Ordering of Social Density
Coefficients for Each Play Area

Area	Size (sq.ft.)	Mean
High Density		
9-Swings	2.3	.02771
10-Table in sand	8.0	.00372
5-Firepole	1.6	.00261
1-Stairs	16.0	.00068
3-Net climber	22.9	.00065
12-Enclosed area	92.4	.00051
14-Sand	280.2	.00033
7-Top of structure	25.8	.00023
4-Bench	9.0	.00023
Moderate Density		
20-Pavement	1816.6	.00014
25-Pavement	630.8	.00013

(table continues)

Area	Size (sq.ft.)	Mean
Moderate Density		
16-Knoll	396.7	.00013
24-Grass	478.5	.00012
21-Pavement	772.8	.00012
8-Slide	55.2	.00011
2-Top of structure	518.1	.00011
11-Sand under structure	108.3	.00011
Low Density		
6-Stairs	61.2	.00010
13-Sand around structure	544.0	.00009
19-Pavement	334.6	.00007
18-Pavement	275.3	.00005
23-Grass	470.4	.00005
15-Sand around structure	272.7	.00005
17-Knoll	222.3	.00003
22-Pavement	870.8	.00001

(table continues)

Area	Size (sq.ft.)	Mean
Private area	37.2	.00051
Total play structures	656.5	.00026
Total pavement	2408.5	.00016
Total sand	1674.6	.00013

Note. Social density coefficients were calculated by dividing the mean proportion of play in each area by the square feet of that area.

Table 18

Playground 2: Rank Ordering of Social Density
Coefficients for Each Play Area

Areas	Size (sq.ft.)	Mean
High Density		
4-Traditional swings	1.3	.06088
5-Tire swing	3.4	.03801
11-Sand	29.7	.00508
8-Picnic table	14.3	.00339
1-Stairs	21.5	.00110
2-Top of structure	47.5	.00110
Moderate Density		
9-Enclosed area	52.7	.00078
3-Slide	40.9	.00076
12-Sand around structure	83.0	.00046
16-Pavement	253.4	.00038
6-Net climber	26.8	.00036

(table continues)

Area	Size (sq.ft.)	Mean
Moderate Density		
17-Pavement	91.3	.00030
7-Climber	25.3	.00029
Low Density		
19-Grass	145.9	.00020
15-Pavement	233.2	.00020
18-Grass	488.9	.00019
14-Sand	318.1	.00019
10-Sand around structure	208.9	.00004
13-Sand around structure	213.1	.00001
Total play structure	166.7	.00198
Private area	52.7	.00078
Total pavement	578.0	.00030
Total sand	852.8	.00030

(table continues)

Note. Social density coefficients were calculated by dividing the mean proportion of play in each area by the square feet of that area

Table 19

Playground 3: Rank Ordering of Social Density
Coefficients for Each Play Area

Area	Size (sq.ft.)	Mean
High Density		
7-Horizontal Beam	.8	.02024
6-Firepole	2.1	.00365
10-House-like structure	15.3	.00349
9-Ledge	3.2	.00259
11-House-like structure	23.0	.00133
5-Slide	28.5	.00122
1-Stairs	35.7	.00105
Moderate Density		
4-Top of structure	35.4	.00081
12-Table in sand	5.5	.00078
8-Climber	21.7	.00074
3-Top of structure	18.1	.00071
2-Top of structure	14.8	.00056

(table continues)

Area	Size (sq. ft.)	Mean
Moderate Density		
15-Sand	429.2	.00040
20-Grass	265.2	.00034
Low Density		
14-Sand around structure	440.7	.00028
16-Pavement	265.2	.00026
17-Pavement	639.5	.00021
19-Grass	889.4	.00010
18-Grass	615.0	.00009
13-Sand around structure	81.7	.00001
Total private areas	71.2	.00147
Total play structure	127.8	.00118
Total sand	957.1	.00031
Total pavement	904.7	.00022

Note. Social density coefficients were calculated by dividing the mean proportion of play in each area by the square feet of that area.

Table 20

Playground 4: Rank Ordering of Social Density
Coefficients for Each Play Area

Area	Size (sq.ft.)	Mean
High Density		
9-Tire swing	4.3	.03000
2-Playhouse	22.6	.00115
10-Ledge	2.6	.00077
3-Top of structure	54.9	.00073
4-Top of structure	15.5	.00065
Moderate Density		
15-Pavement	446.4	.00054
16-Pavement	251.4	.00054
1-Stairs	17.6	.00051
5-Slide	33.1	.00040
11-Sand under structure	119.6	.00037
12-Sand	449.3	.00034

(table continues)

Area	Size (sq.ft.)	Mean
Low Density		
17-Pavement	245.6	.00033
6-Firepole	1.8	.00028
14-Sand around structure	221.9	.00024
18-Pavement	152.5	.00019
13-Sand around structure	131.3	.00019
7-Net climber	25.6	.00017
Total play structure	155.4	.00134
Private area	22.6	.00115
Total pavement	1094.9	.00045
Total sand	922.1	.00030

Note. Social density coefficients were calculated by dividing the mean proportion of play in each area by the square feet of that area.

Appendix H

Table 21

Playground 1: Mean Proportion of Play In
Interaction With a Teacher in Each Area in
Descending Order of Frequency

Area	Mean
25-Grass	.11
14-Sand	.08
21-Pavement	.07
24-Grass	.06
22-Pavement	.05
13-Sand around structure	.05
21-Pavement	.04
9-Swings	.03
15-Sand around swings	.03
2-Top of structure	.03
23-Grass	.02
6-Stairs	.02
12-Enclosed area	.02

(table continues)

Area	Mean
3-Net climber	.01
16-Knoll	.01
1-Stairs	.01
18-Pavement	.01
19-Pavement	.01
11-Sand under structure	.00
4-Bench	.00
5-Firepole	.00
7-Top of structure	.00
6-Slide	.00
17-Knoll	.00
10-Table in sand	.00
<hr/>	
Total pavement	.08
Total sand	.15
Total play structure	.08
Total private area	.02

Table 22

Playground 2: Mean Proportion of Play in
Interaction With a Teacher In Each Area in
Descending Order of Frequency

Area	Mean
18-Grass	.09
19-Grass	.08
4-Traditional swings	.08
12-Sand around structure	.07
3-Slide	.07
8-Picnic table	.07
6-Net climber	.06
11-Sand	.06
16-Pavement	.05
2-Top of structure	.04
14-Sand around structure	.04
15-Pavement	.03
1-Stairs	.03
17-Pavement	.01

(table continues)

Area	Mean
5-Tire swing	.01
10-Sand around structure	.01
9-Enclosed area	.01
4-Climber	.00
<hr/>	
Total pavement	.06
Total sand	.09
Total apparatus	.14
Private area	.01

Note. Areas with very few overall observations of play are not included.

Table 23

Playground 3: Mean Proportion of Play in
Interaction With a Teacher in Each Area in Descending
Order of Frequency

Area	Mean
16-Pavement	.10
20-Grass	.08
19-Grass	.08
14-Sand around structure	.06
17-Pavement	.06
11-House-like structure	.04
3-Top of structure	.04
8-Climber	.04
18-Grass	.03
15-Sand	.03
4-Top of structure	.03
2-Top of structure	.01
5-Slide	.01
1-Stairs	.01

(table continues)

Area	Mean
7-Horizontal bar	.00
10-House-like-structure	.00
12-Table in sand	.00
6-Firepole	.00
9-Ledge	.00
<hr/>	
Total pavement	.13
Total sand	.05
Total play structure	.05
Total private area	.09

Note. Areas with very few overall observations of play are not included.

Table 24

Playground 4: Mean Proportion of Play in
Interaction With a Teacher in Each Area in
Descending Order of Frequency

Area	Mean
16-Pavement	.11
9-Tire swing	.10
1-Stairs	.06
17-Pavement	.07
12-Sand	.07
15-Pavement	.06
2-Playhouse	.05
18-Pavement	.03
5-Slide	.03
3-Top of structure	.02
7-Net climber	.02
11-Sand under structure	.02
14-Sand around structure	.01

(table continues)

Areas	Mean
13-Sand around structure	.00
4-Top of structure	.00
<hr/>	
Total pavement	.09
Total sand	.07
Total play structure	.14
Private area	.05

Note. Areas with very few overall observations of play are not included.

Appendix I

Mean Proportion of Play in Each Social
Participation Category in Each Play Area

Appendix I

Table 25

Playground 1: Mean Proportion of Play in Each Social Participation

Category in Each Play Area

Area	Categories						
	Uno	Sol	Onl	Par	Ass	Coo	Agg
1-Stairs	.000	.208	.056	.388	.222	.125	.000
2-Top of structure	.155	.376	.030	.321	.095	.023	.000
3-Climber	.000	.542	.125	.250	.083	.000	.000
4-Bench	.083	.000	.583	.167	.167	.000	.000
5-Firepole	.000	.500	.417	.000	.000	.083	.000
6-Stairs	.056	.306	.000	.111	.250	.278	.000
7-Top of structure	.149	.000	.460	.300	.091	.000	.000

(table continues)

Area	Categories						
	Uno	So1	On1	Par	Ass	Coo	Agg
8-Slide	.171	.179	.143	.279	.057	.171	.000
9-Swings	.049	.702	.004	.000	.219	.016	.000
10-Table In sand	.131	.000	.083	.659	.127	.000	.000
11-Sand under structure	.380	.167	.000	.250	.130	.074	.000
12-Enclosed area	.237	.052	.105	.088	.456	.062	.000
13-Sand around structure	.319	.167	.136	.021	.297	.059	.000
14-Sand box	.277	.133	.102	.221	.257	.010	.000
15-Sand around swings	.061	.505	.000	.010	.323	.091	.000
16-Kno11	.296	.080	.070	.114	.285	.147	.008
17-Kno11	.111	.406	.152	.236	.073	.000	.023
18-Pavement	.279	.043	.204	.189	.237	.047	.000

(table continues)

Area	Categories						
	Uno	Sol	Onl	Par	Ass	Coo	Agg
19-Pavement	.266	.161	.138	.081	.236	.113	.005
20-Pavement	.268	.199	.124	.111	.217	.081	.001
21-Pavement	.324	.150	.072	.140	.207	.093	.014
22-Pavement	.229	.316	.121	.100	.234	.000	.000
23-Grass	.238	.080	.184	.158	.220	.096	.024
24-Grass	.232	.136	.207	.055	.211	.165	.000
25-Grass	.266	.161	.138	.081	.236	.113	.005

Note. Uno=Unoccupied; Sol=Solitary; Onl=Onlooker; Par=Parallel; Ass=Associative; Coo=Cooperative; Agg=Aggression. Mean proportions are based only on the subjects included in the 4 (Playground) X 4 (Play area) repeated measures analyses of variance. Rows sum to 1.

Table 26

Playground 2: Mean Proportion of Play in Each Social Participation Category in Each Play Area

Area	Categories						
	Uno	Sol	Onl	Par	Ass	Coo	Agg
1-Stairs	.051	.171	.104	.450	.215	.010	.000
2-Top of structure	.294	.073	.239	.140	.194	.059	.000
3-Slide	.098	.215	.027	.240	.321	.098	.000
4-Traditional swings	.059	.046	.062	.438	.285	.098	.009
5-Tire swing	.035	.065	.043	.095	.106	.656	.002
6-Net Climber	.298	.314	.045	.100	.043	.200	.000
7-Cylinder climber	.025	.000	.050	.542	.383	.000	.000
8-Picnic table	.162	.167	.090	.083	.169	.328	.004

(table continues)

Area	Categories						
	Uno	Sol	Onl	Par	Ass	Coo	Agg
9-Enclosed area	.146	.225	.306	.094	.143	.087	.000
10-Sand around structure	.056	.056	.185	.167	.111	.426	.000
11-Sand box	.122	.217	.163	.097	.247	.151	.003
12-Sand around structure	.162	.152	.199	.163	.265	.058	.000
13-Sand around structure ^a	.250	.250	.000	.500	.000	.000	.000
14-Sand around structure	.022	.036	.029	.375	.239	.301	.019
15-Pavement	.157	.123	.058	.203	.316	.144	.000
16-Pavement	.185	.185	.126	.168	.172	.161	.000
17-Pavement	.065	.160	.236	.191	.151	.198	.000
18-Grass	.183	.102	.083	.271	.248	.112	.000
19-Grass	.212	.142	.074	.143	.265	.148	.017

(table continues)

Note. Uno=Unoccupied; Sol=Solitary; Onl=Onlooker; Par=Parallel; Ass= Associative; Coo=Cooperative; Agg=Aggression. Mean proportions are based only on the subjects included in the 4 (Playground) X 4 (Play area) repeated measures analyses of variance. Rows sum to 1.

^a-Proportions are based on very few observations for this play area.

Table 27

Playground 3: Mean Proportion of Play in Each Social Participation Category in Each Play Area

Area	Categories						
	Uno	Sol	Onl	Par	Ass	Coo	Agg
1-Stairs	.041	.110	.159	.241	.186	.262	.000
2-Enclosed area	.364	.029	.050	.246	.179	.133	.000
3-Enclosed area	.179	.054	.143	.138	.125	.236	.125
4-Top of structure	.116	.100	.090	.302	.268	.126	.000
5-Slide	.071	.436	.007	.303	.160	.018	.000
6-Firepole	.000	.250	.000	.500	.250	.000	.000
7-Horizontal bar	.142	.157	.153	.138	.243	.167	.000
8-Climber	.000	.235	.008	.485	.264	.008	.000

(table continues)

Area	Categories						
	Uno	So1	On1	Par	Ass	Coo	Agg
9-Ledge	.120	.143	.092	.227	.044	.374	.000
10-House-11ke structure	.037	.080	.048	.128	.383	.325	.000
11-House-11ke structure	.050	.049	.057	.072	.587	.173	.012
12-Table In sand	.000	.333	.167	.292	.208	.000	.000
13-Sand under structure ^a	.000	.000	.000	.500	.000	.500	.000
14-Sand around structure	.143	.227	.122	.150	.275	.074	.006
15-Sand	.160	.147	.158	.281	.193	.053	.007
16-Pavement	.165	.160	.166	.183	.268	.056	.007
17-Pavement	.164	.230	.149	.129	.226	.094	.008
18-Grass	.208	.276	.055	.147	.199	.114	.000

(table continues)

Area	Categories							
	Uno	Sol	Onl	Par	Ass	Coo	Agg	
19-Grass	.163	.273	.096	.208	.141	.107	.005	
20-Grass	.121	.192	.207	.160	.222	.095	.010	

Note. Uno=Unoccupied; Sol=Solitary; Onl=Onlooker; Par=Parallel; Ass=Associative; Coo=Cooperative; Agg=Aggression. Mean proportions are based only on the subjects included in the 4 (Playground) X 4 (Play area) repeated measures analyses of variance. Rows sum to 1.

^a-Proportions are based on very few observations for this play area.

Table 28

Playground 4: Mean Proportion of Play in Each Social Participation Category in Each Play Area

Area	Categories						
	Uno	Sol	Onl	Par	Ass	Coo	Agg
1-Stairs	.019	.252	.000	.324	.350	.056	.000
2-Playhouse	.066	.244	.000	.360	.249	.082	.000
3-Top of structure	.125	.091	.104	.373	.274	.029	.000
4-Top of structure	.143	.040	.090	.399	.329	.000	.000
5-Slide	.000	.250	.125	.265	.106	.254	.000
6-Firepole ^a	.000	1.00	.000	.000	.000	.000	.000
7-Net climber	.111	.000	.000	.309	.583	.000	.000

(table continues)

Area	Categories						
	Uno	Sol	Onl	Par	Ass	Coo	Agg
8-Horizontal Bar	.000	.000	.000	.000	.000	.000	.000
9-Tire swing	.046	.000	.017	.082	.081	.772	.000
10-Ledge ^a	.000	.000	.000	.000	.000	.000	.000
11-Sand under structure	.094	.072	.134	.120	.426	.111	.044
12-Sand	.159	.209	.178	.169	.211	.069	.005
13-Sand around structure	.006	.040	.267	.040	.057	.591	.000
14-Sand around structure	.113	.118	.140	.208	.303	.118	.000
15-Pavement	.184	.245	.144	.231	.161	.023	.003
16-Pavement	.080	.130	.124	.246	.263	.153	.004
17-Pavement	.181	.246	.076	.202	.295	.000	.000
18-Pavement	.172	.190	.083	.113	.343	.099	.000

Note. Uno=Unoccupied; Sol=Solitary; Onl=Onlooker; Par=Parallel; Ass= Associative; Coo=Cooperative; Agg=Aggression. Mean proportions are based only on the subjects included in the 4 (Playground) X 4 (Play area) repeated measures analyses of variance. Rows sum to 1.

^a=Proportions are based on very few observations for these play areas.

Appendix J
Mean Proportion of Play in Each Activity
Category in Each Play Area

Table 29

Playground 1: Mean Proportion of Play in Each Activity Category in Each Area

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
1-Stairs	.056	.597	.167	.000	.125	.000
2-Top of structure	.004	.564	.215	.000	.032	.000
3-Climber	.064	.728	.083	.000	.000	.000
4-Bench	.000	.167	.167	.000	.000	.000
5-Firepole	.000	.583	.000	.000	.000	.000
6-Stairs	.000	.667	.167	.000	.000	.111
7-Top of structure	.008	.300	.083	.000	.000	.000
8-Slide	.000	.514	.029	.000	.000	.143
9-Swings	.009	.810	.120	.000	.000	.000

(table continues)

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
10-Table in sand	.355	.032	.127	.272	.000	.000
11-Sand under structure	.176	.278	.093	.037	.037	.000
12-Enclosed area	.009	.218	.323	.013	.095	.000
13-Sand around structure	.081	.160	.232	.017	.059	.000
14-Sandbox	.155	.137	.209	.111	.009	.009
15-Sand around swings	.206	.493	.142	.000	.092	.000
16-Knoll	.021	.315	.189	.000	.100	.000
17-Knoll	.273	.056	.073	.314	.000	.000
18-Pavement	.115	.255	.126	.000	.021	.000
19-Pavement	.029	.498	.154	.000	.178	.000
20-Pavement	.037	.348	.115	.007	.055	.005

(table continues)

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
21-Pavement	.109	.287	.108	.000	.065	.013
22-Pavement	.028	.430	.193	.000	.000	.000
23-Grass	.030	.328	.101	.008	.047	.039
24-Grass	.035	.235	.132	.000	.131	.011
25-Grass	.052	.241	.187	.000	.110	.007

Note. FMO=Fine Motor; Mot=Motor; Dia=Dialogue; Fan=Fantasy; Gam=Games.
 Mean proportions are based only on the subjects included in the 4
 (Playground) X 4 (Play area) repeated measures analyses. Rows add up to
 1 when the mean proportions of Unoccupied, Onlooker, and Aggression for
 each area are included in the sum.

Table 30

Playground 2: Mean Proportion of Play in Each Activity Category in Each Area

Area	Categories					
	Fmo	Mot	Dia	Con	Fan	Gam
1-Stairs	.010	.633	.148	.019	.008	.026
2-Top of structure	.132	.121	.165	.000	.046	.000
3-Slide	.109	.113	.152	.000	.046	.000
4-Traditional swings	.018	.681	.163	.000	.004	.000
5-Tire swing	.012	.628	.062	.061	.147	.000
6-Net climber	.167	.398	.043	.000	.200	.000
7-Cylinder climber	.000	.568	.356	.000	.000	.000
8-Picnic table	.007	.462	.116	.000	.044	.112
9-Enclosed area	.143	.177	.115	.000	.104	.009

(table continues)

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
10-Sand around structure	.019	.518	.111	.000	.111	.000
11-Sand box	.075	.345	.192	.020	.077	.000
12-Sand around structure	.037	.340	.218	.000	.044	.000
13-Sand around structure ^a	.750	.000	.000	.000	.000	.000
14-Sand around structure	.145	.208	.217	.132	.211	.015
15-Pavement	.051	.340	.242	.016	.140	.000
16-Pavement	.050	.462	.135	.024	.014	.000
17-Pavement	.147	.343	.107	.053	.056	.000
18-Grass	.128	.336	.208	.022	.030	.008
19-Grass	.211	.221	.241	.017	.000	.000

(table continues)

Note. FMO=Fine Motor; Mot=Motor; Dia=Dialogue; Fan=Fantasy; Gam=Games.

Mean proportions are based only on the subjects included in the 4 (Playground) X 4 (Play area) repeated measures analyses. Rows add up to 1 when the mean proportions of Unoccupied, Onlooker, and Aggression for each area are included in the sum.

^a=Proportions are based on very few observations for this play area

Table 31

Playground 3: Mean Proportion of Play in Each Activity Category in Each Area

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
1-Stairs	.053	.533	.144	.000	.023	.045
2-Enclosed area	.014	.332	.079	.029	.133	.000
3-Enclosed area	.072	.179	.000	.054	.125	.125
4-Top of structure	.014	.440	.233	.060	.048	.000
5-Slide	.134	.595	.181	.007	.000	.000
6-Firepole	.000	.947	.053	.000	.000	.000
7-Horizontal Bar	.201	.205	.111	.000	.188	.000
8-Climber	.111	.720	.164	.000	.008	.000
9-Ledge	.000	.441	.020	.000	.041	.286

(table continues)

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
10-House-like structure	.245	.131	.142	.098	.300	.000
11-House-like structure	.019	.096	.586	.000	.179	.000
12-Table in sand	.458	.083	.208	.083	.000	.000
13-Sand under structure ^a	.500	.500	.000	.000	.000	.000
14-Sand around structure	.125	.244	.223	.078	.049	.014
15-Sand	.114	.198	.156	.165	.033	.006
16-Pavement	.078	.372	.147	.074	.000	.000
17-Pavement	.051	.336	.199	.007	.041	.045
18-Grass	.090	.366	.172	.004	.060	.048
19-Grass	.051	.497	.128	.007	.030	.024
20-Grass	.044	.387	.180	.044	.008	.000

(table continues)

Note. Fmo=Fine Motor; Mot=Motor; Dia=Dialogue; Fan=Fantasy; Gam=Game.

Mean proportions are based only on the subjects included in the 4 (Playground) X 4 (Play area) repeated measures analyses. Rows add up to 1 when the mean proportions of Unoccupied, Onlooker, and Aggression for each area are included in the sum.

'=Proportions are based on very few observations for this play area.

Table 32

Playground 4: Mean Proportion of Play in Each Activity Category in Each Area

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
1-Stairs	.111	.587	.200	.000	.083	.000
2-Playhouse	.012	.622	.166	.097	.041	.016
3-Top of structure	.092	.360	.248	.000	.071	.000
4-Top of structure	.000	.438	.128	.200	.000	.000
5-Slide	.000	.663	.000	.000	.167	.046
6-Firepole ^a	.000	1.00	.000	.000	.000	.000
7-Net climber	.000	.306	.586	.000	.000	.000
8-Horizontal bar	.000	.000	.000	.000	.000	.000
9-Fire swing	.000	.853	.082	.000	.000	.000

(table continues)

Area	Categories					
	FMO	Mot	Dia	Con	Fan	Gam
10-Ledge ^a	.000	.000	.000	.000	.000	.000
11-Sand under structure	.044	.096	.361	.117	.111	.000
12-Sand	.129	.156	.165	.184	.017	.007
13-Sand around structure	.017	.023	.108	.080	.500	.000
14-Sand around structure	.095	.225	.139	.121	.143	.014
15-Pavement	.161	.371	.106	.007	.020	.004
16-Pavement	.101	.369	.204	.003	.115	.007
17-Pavement	.061	.383	.131	.067	.105	.000
18-Pavement	.143	.309	.195	.000	.099	.000

(table continues)

Note. Fmo=Fine Motor; Mot=Motor; Dia=Dialogue; Fan=Fantasy; Gam=Games.

Mean proportions are based only on the subjects included in the 4 (Playground) X 4 (Play area) repeated measures analyses. Rows add up to 1 when the mean proportions of Unoccupied, Onlooker, and Aggression for each area are included in the sum.

*Proportions are based on very few observations for this play area.

Appendix K

Table 33

Means for Observational Categories and KSCS Factor Scores for Subjects Included in or Excluded from Repeated Measures Analyses

Measures	Subjects	
	Incl (n=49)	Excl (n=23)
Social Participation Measures		
Unoccupied	.151	.150
Solitary	.173	.207
Onlooker	.128	.124
Parallel	.186	.188
Associative	.220	.194
Cooperative	.138	.129
Aggression	.004	.007
Activity Categories		
Fine Motor	.108	.108
Motor	.486	.533

(table continues)

Measures	Subjects	
	Incl (n=49)	Excl (n=23)
Activity Categories		
Dialogue	.234	.219
Constructive	.060	.058
Fantasy	.103	.060
Games	.009	.012
KSCS Factor Scores		
IP-AW	13.0	12.6
CC-AD	139.3	152.7

Notes. Incl=Included in repeated measures analyses; Excl=Excluded from repeated measures analyses. Means are based on untransformed proportions and scores. Columns for the social participation and activity categories both sum up to 1.