

Effects of Play Equipment and Loose Parts on Preschool Children's Outdoor Play Behavior: An Observational Study and Design Intervention

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Abstract

This research project investigated, in two stages, the ways in which playground equipment and the addition of loose parts to a playground contribute to preschool children's dramatic and constructive play behaviors. In the first study, for ten months we observed children attending a lab preschool as they played on large, multi-station outdoor play structures in order to identify design features of outdoor play equipment that encourage particular play behaviors and social interaction. The design features that encouraged fantasy play were enclosed spaces with visibility to other areas of the playground, nodes and connector spaces, and stage-type spaces. Boys engaged in more functional play while girls engaged in more fantasy play. The second study, conducted with the same lab preschool but different children, tested the effects of a design intervention on the playground. We added loose parts suitable for constructing spaces to the playground and we observed children's play behavior before, during and after the intervention. Constructive play behavior increased in the areas of the playground to which we had added the loose parts. Children used the places they constructed for dramatic play activities. The second study confirmed findings from the first study that young children like to act out dramatic play themes in small, enclosed spaces. In the second study, children were able to construct their own spaces, which not only encouraged dramatic play but also communication and negotiation skills.

Keywords: pre-school children, outdoor play, playgrounds, playground design, play

Introduction

Virtually all children engage in play activity regardless of nationality or cultural background. Play is important for children because it is enjoyable; there is value in play merely for the joy of doing so and children need not have particular goals in mind in order to have fun. However, play also has the potential to be a rich vehicle for children to develop skills such as divergent thinking, language, abstract thought, conversation, and problem solving. While the outdoors is often viewed as a place primarily for non-goal directed play, the outdoors can be just as supportive of the same variety of developmental skills as indoor play. Therefore, the outdoor physical environment should be designed to support the full spectrum of children's play.

This paper examines in two studies the effect of play equipment and materials in an outdoor setting on the types of pre-school children's play. The specific objectives were to 1) examine how specific features of outdoor play equipment and materials affect the play behavior of preschool age children, and 2) develop and test preliminary design principles for equipment and materials for children's outdoor play. The first study examined the range of play activities in which preschool children engaged on playground equipment that was purported to encourage dramatic play and social interaction. The second study included an experimental intervention based on the findings of the first study. The latter study hypothesized that dramatic and constructive play would be increased by providing loose parts in the play setting.

Play research has primarily focused on adult and peer effects on play activities and most of this research has looked at indoor settings. Although some researchers have examined children's outdoor play, much of this work has focused on general characteristics such as traditional versus adventure playground design and effects on play behaviors and social interaction. The role of specific physical features of play equipment and materials in outdoor settings has received scant attention. This paper addresses this gap in the literature.

Types of Play

Dramatic and constructive play behaviors are considered "higher order" play behaviors. Different thinking processes are available to children at different stages of development. As children develop their play becomes more complex, resulting in increased constructive and dramatic play (Parten 1932; Piaget 1962) (see Table 1). Constructive play consists of children building or creating objects with a specific goal in mind (e.g., a bridge, a house). Dramatic play—also known as symbolic, pretend, fantasy, make-believe, or imaginary play—consists of children taking on a role in which they pretend to be someone, or something, else. They may imitate a person's or animal's action and speech patterns using real or imagined "props." Dramatic play is especially important in the development of social, emotional, and cognitive development because it provides a child with the opportunity to use an object to represent something else, the basis of abstract thought (Vygotsky 1976; Pepler and Rubin 1982; Rubin 1982). Several studies with preschool age children have indicated a relationship between dramatic play and performance on cognitive tasks (Rubin, Maioni and Hornung 1976), language (Pellegrini 1980; Wolfgang and

Sanders 1981; Neuman and Roskos 1990; Morrow and Rand 1991; Einarsdottir 1996), and scholastic achievement (Smilansky and Shefatya 1990).

Table 1. Play and social interaction behavior descriptions

<u>Play Behavior</u>	<u>Definition</u>
Dramatic/Fantasy	Child takes on an imaginary role or using objects to represent something imaginary. Includes children playing "house" or pretending to be animals, etc.
Constructive	Child's activity is goal-oriented. Activities include building blocks, or climbing to the top of a structure, etc.
Functional	Repetitive muscle movements; running, climbing, splashing, jumping, riding a bike, and spinning.
Games with rules	Games with universal rules such as tag, dodge ball, hide-and-go-seek.
Non-play	Child is not involved in any of the above play. Examples of non-play are watching others, between activities, sitting and talking about non-play related topics, teacher-assigned tasks (e.g., cleaning up).
<u>Interaction behaviors</u>	
Solitary	Child plays alone or independently, makes no reference to others and makes no effort to include other children in his or her play.
Parallel	Child plays independently beside, but not with, another child. Child does not try to influence others in play.
Positive interaction	Child plays with others in mutual acknowledgment and is activity-oriented. Child's actions are complementary with others, and/or child engages in conversation about common activity.
Negative interaction	Child's play with others involves aggression and/or name-calling.

Types of Play Settings

Certain types of outdoor play settings have been associated with specific play behaviors more than others. Functional, or solely physical, play seems to occur more frequently on traditional playgrounds while constructive or dramatic play is

more likely on adventure playgrounds (Frost 1992; Hayward, Rothenberg and Beasley 1974). On traditional playgrounds, children's options are usually limited to several non-connected pieces of equipment that are placed on a flat, hard surface. Adventure playgrounds have little pre-existing equipment but contain a host of "loose parts" (i.e., lumber, tires, large cardboard boxes, stackable blocks) that children can use in ways related to play themes, thereby increasing constructive and dramatic play opportunities.

Contemporary playgrounds also foster dramatic play. These settings often have large, multi-stationed equipment that may include house-type enclosures, nets, poles, slides, tire swings, bridges, and stairs. Since a number of children can use this type of equipment concurrently, social interaction is likely and children often develop dramatic play themes. Children sometimes have the opportunity to bring loose parts to contemporary playground settings, thereby increasing play themes.

Play Materials and Equipment

These generalized categories of playground types and their relation to certain play behaviors have been challenged (Brown and Burger 1984). The argument is that research in outdoor play settings would benefit from more specific descriptions of design features on playgrounds rather than broad categories such as "traditional" or "contemporary." Brown and Burger found no significant differences on the social, language, or motor behaviors of preschool children playing on traditional versus contemporary playgrounds. However, there were differences between individual playgrounds. The playground with the highest aesthetic evaluation rating—a contemporary playground—had the lowest social, language, and motor development scores. Conversely, the playground with the lowest aesthetic rating promoted the highest level of positive social, language, and vigorous motor behaviors.

The latter playground was considered a traditional playground because it was in a parking lot with a blacktop, asphalt surface and surrounded by a chain link fence. However, this playground contained play structures with encapsulated areas. These enclosed areas as part of outdoor play are often preferred by young children and seem to promote cognitively and socially complex behaviors (Kruidenier 1978; Gramza, Corush and Ellis 1972). Distinctions between playground types may be more cosmetic than substantive while specific equipment and materials available on the playground may be more relevant (Weinstein and Pinciotti 1988). In other words, the design type of the playground may have less to do with children's play behavior than the array of play materials available.

Traditional playgrounds can support more complex play when the appropriate materials are provided. Less unoccupied play, i.e., standing around, was found on an otherwise traditional playground that included "loose parts"—moveable components such as tires, cable spools, wooden crates, and boards (Hart and Sheehan 1986). "Loose parts" refers to open-ended play materials and manipulatives that children can use in a variety of ways (Nicholson 1971). Another study found that children's play behaviors on a creative playground (also known as adventure playground) were more varied than on a traditional playground (Frost

and Campbell 1985). Both playgrounds in Frost's and Campbell's study had equipment, but the creative playground also contained loose parts. The dominant choices of children on both playgrounds were for equipment with movable features; children preferred action-oriented equipment over static equipment and equipment that could be used for multiple functions over a single function. Equipment that was designed primarily for functional play such as monkey bars, and ladders, was used less than one-fourth of the time. Equipment that was designed for dramatic play, such as the playhouse, was used over half of the time.

In preschool classrooms, play props, play materials, and manipulatives encourage social interaction (Quay, Weaver and Neel 1986), constructive play, and dramatic play (Smilansky and Shefatya 1990). In addition, children often play with open-ended play materials (e.g., cardboard boxes, pipe cleaners, and pieces of cloth) longer and in more ways than play materials with well defined intended uses (e.g., tea sets, dolls, trucks, and tool kits) (Bagley and Klass 1997). Lastly, loose parts that can be manipulated and used to construct, invent, and modify spaces are valuable for children's learning because making a space requires children to be creative, experiment with physics, and instills pride (Nicholson 1971). These studies suggest that loose parts are valuable for children's development and learning.

Researchers examined two types of dramatic play centers in preschool settings, one that had props to support "house keeping" play and another that had props with no intended thematic uses (Bagley and Klass 1997). More socio-dramatic play was found in the classrooms whose play center had props with no intended use. Children played longer, with more props, and demonstrated higher levels of socio-dramatic play. This suggests that the quality of play materials can influence dramatic play.

Loose parts are also important for constructive play. First, constructive play with blocks and other loose parts teaches children balance and elements of physics (Haas 1996) and encourages the use of both fine and gross motor skills. Another way that loose parts can be used by children is for place-making—creating an area that has boundaries. Blocks, trees, or other materials can function as walls, ceiling, and floor. Although no empirical work has been done to date, children's involvement in the process of designing, planning, and building a play space can provide an immense opportunity for learning and creativity (Nicholson 1971). Nicholson suggests that spaces designed for children should be left unfinished to allow them to invent and build. Loose parts allow children to make their own spaces, invent, construct, evaluate, and modify their environment. Playing in a space that they build gives children a sense of ownership over the space while also instilling pride. The current research seeks to provide empirical evidence that children do in fact build spaces when appropriate loose parts are provided.

Previous research on loose parts in preschool environments has been limited to indoor environments; no empirical work has been done outdoors. Moreover no studies have isolated loose parts or play props; instead, they have been studied in conjunction with thematic play areas. There is also a lack of research related to the use of loose parts to manipulate or build spaces.

The Current Studies

The present research, conducted in two studies, examines how specific playground equipment and loose parts support preschool children's dramatic and constructive play. The first study looked at how children use playground equipment purported to encourage dramatic play. Findings from this study suggest certain design features for outdoor play settings that support dramatic and constructive play. In the second study, we incorporated several of these design features into an intervention to test their effects on children's dramatic and constructive play.

The child care program that was the site for both studies is a university-based program. The program serves as a laboratory school for the College of Human Ecology at Cornell University. When a child is registered for the program, parents are made aware of the possibility that his or her child may be involved in research projects. Therefore, all of the children registered in the center at the time of the study were participants in the study. The majority of the children who attend the program have parents who are in some way connected to the university (faculty, staff, or student) with a few slots available for children from the surrounding community.

The playground is immediately adjacent to the day care center and is enclosed by a fence. The topography is such that there is an upper and lower playground; a steep hill divides the space. A large, multi-stationed play structure is located in both the upper and lower sections of the playground. In addition, there is a separate playhouse structure, and two sheds (see Figures 1 and 2).

Figure 1. Upper playground

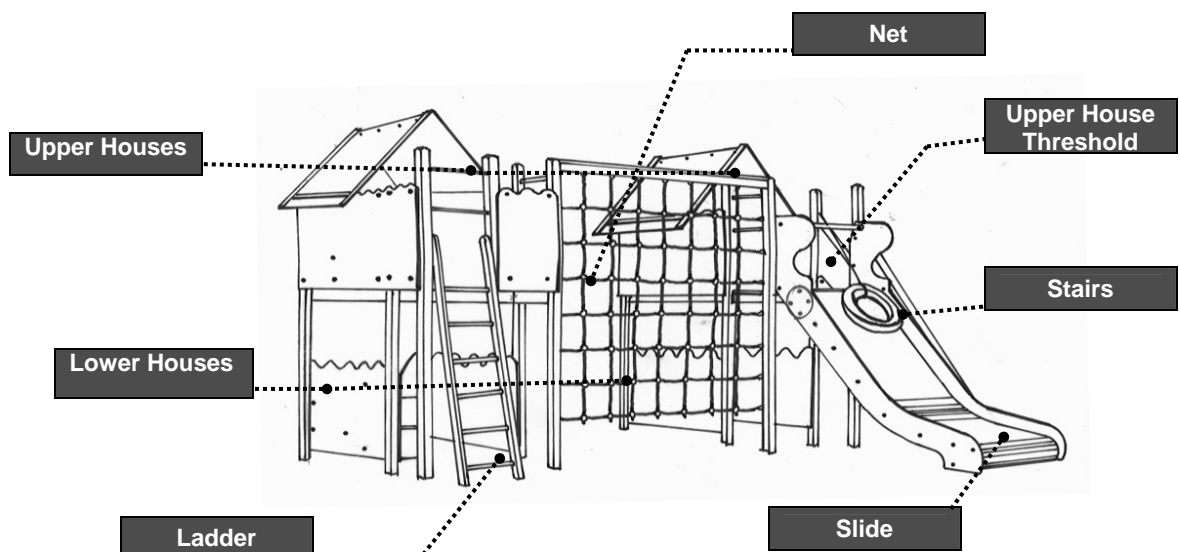
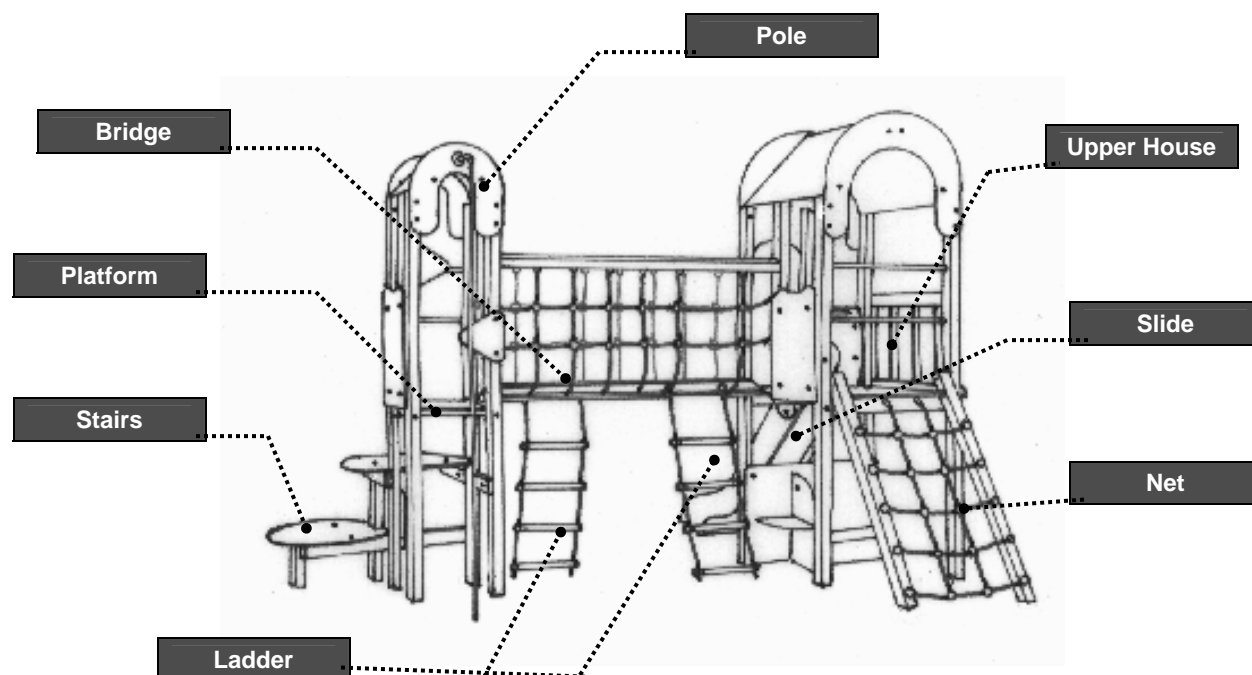


Figure 2. Lower playground

The day care program consists of two multi-age classes (3- to 5-year-olds). The two day care classes alternate on a daily basis using the upper and lower playground during outdoor play time. All children go outside for 30-40 minutes around lunch time and for briefer periods during the midmorning and/or late afternoon prior to being picked up by their parents/ guardians. Outdoor play occurs all year long except during heavy rain or bitter cold.

Study I

Participants

Fifty-seven children at the university day care participated in the study. Over the course of the observation period, the children ranged in age from 38 to 64 months (M=51 months). Fifty-six percent of the study participants were boys.

Procedures

Our research team observed children on both the upper and lower playgrounds during regular outdoor play periods. The play structures differ slightly between the upper and lower playgrounds. Teachers selected the playground to be used for the play period, so children were not free to choose the playground where they wanted to play. However, all children had the opportunity to use each playground several times a week.

Trained college undergraduate observers visited the pre-school classroom several times prior to beginning the formal observations in order to become acquainted

with the children. In addition, each observer carried a class picture with each child identified by name. Observers were close enough to the play structures to hear children's conversations. Children at this lab school are routinely observed by college students and appear to be rather oblivious to the presence of college student visitors.

Observations occurred from September through May. We coded children's behavior only when they played on the play structures. We observed children on a rotating basis for one minute and coded their behavior and type of social interaction every ten seconds.¹ If a child left the equipment for longer than ten seconds during the coding period, the child was dropped and coding began with another child.

At ten-second intervals, the observer coded the subject's play behavior (functional, constructive, dramatic/fantasy, non-play) and social interaction (solitary, parallel, positive interaction, negative interaction)² (See Table 1 above). The type of play behavior and type of social interaction were each recorded separately. In the rare instances when multiple types of behavior or social interaction occurred within the same ten-second observational period, the type that predominated was coded. The observer noted the location of the behavior,³ whether an object (loose part) was involved, and whether or not the teacher had initiated the activity. At the beginning of each observation period, observers noted the weather conditions (warm, cold, snow, rain) and if the shed, which contained loose parts and riding equipment such as tricycles and wagons, was opened. There were a total of 3,144 separate recorded observations over the nine-month study period. The inter-rater reliability, calculated using kappa, was excellent, $k = .94$ (Landis and Koch 1977).⁴

¹ When an observer arrived at the playground, he or she randomly picked a child to begin the observations. Only children playing on the equipment were targeted for observation. When the observation period for one child was complete, observations began with another child playing on the equipment.

² A transitional category was also part of the coding scheme. The subject's behavior was coded as transitional if he or she was going from one activity to another on the equipment but clearly still engaged with the equipment.

³ Location on the equipment indicates the child's engagement with the equipment, e.g., on the slide or playing next to the slide, touching the slide, or somehow involving the slide in the play activity.

⁴ The same observation instrument was used for both studies.

Results

Table 2. Types of play and interaction on the upper playground

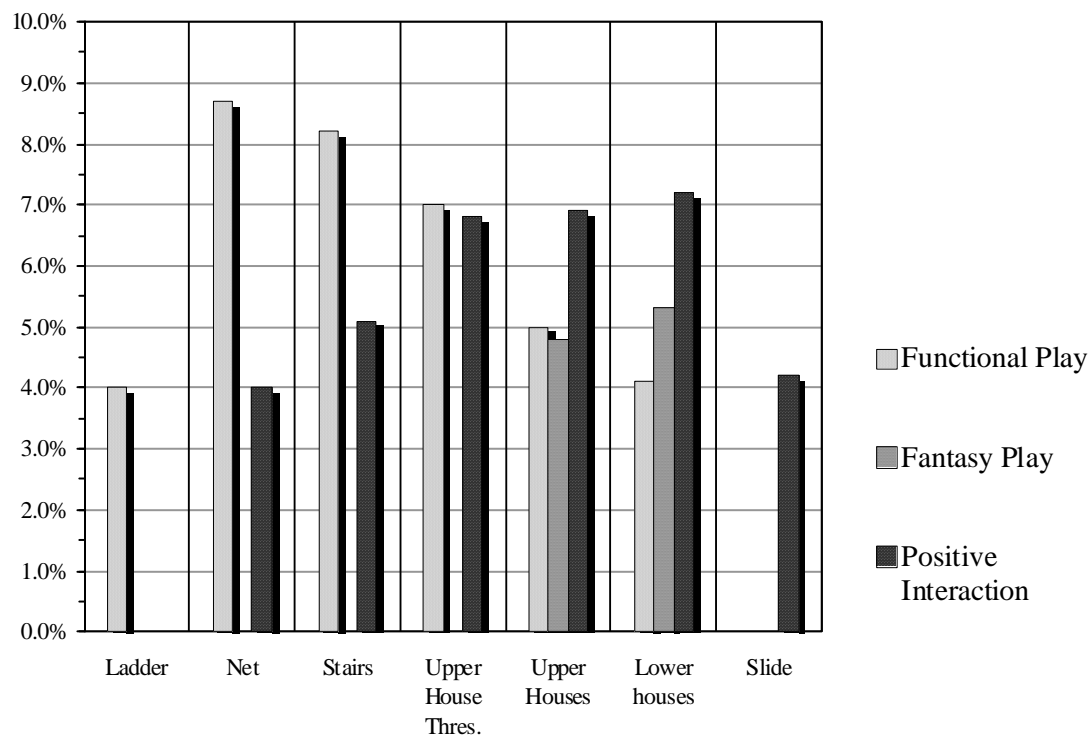
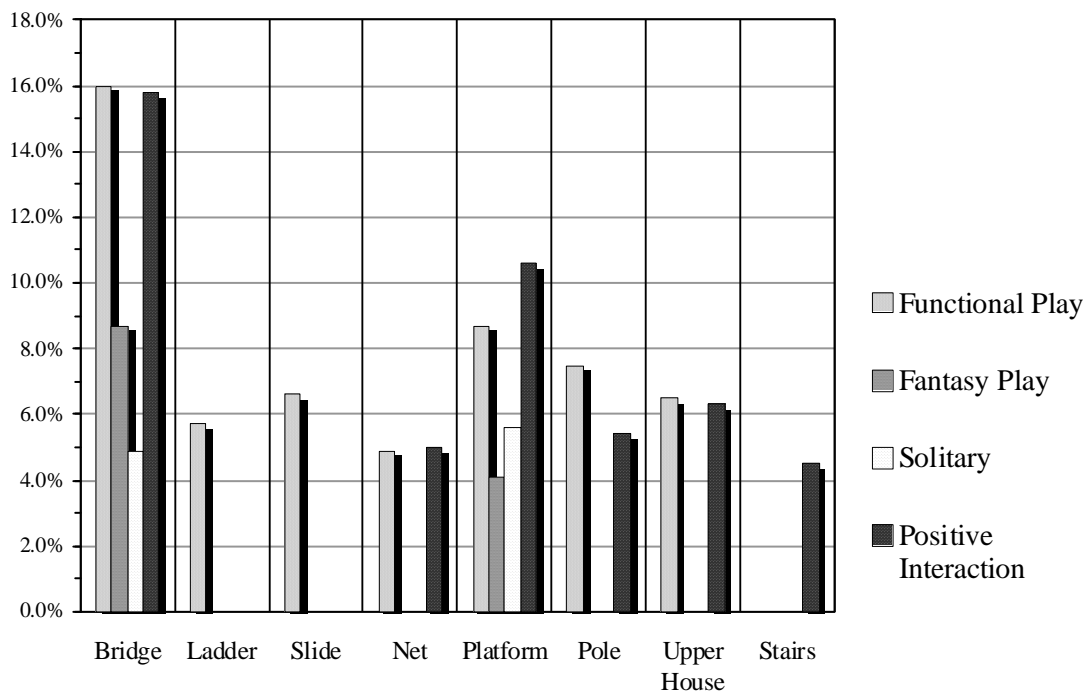


Table 3. Types of play and interaction on the lower playground



The majority of the play behavior observed on both play structures was functional (54.2 percent). As indicated in Table 1, functional play primarily consists of repetitive muscle movements such as running, climbing, splashing, jumping, or riding a bike. These activities are done purely for the pleasure of moving and are non goal-oriented. Dramatic/fantasy play accounted for 25 percent of the observed play, while observers identified only a small amount (5 percent) of the play as constructive. Constructive play is goal-oriented and includes such activities as building a tower or climbing to the top of a structure. Transitional behavior occurred 16.2 percent of the time, and less than 1 percent of all activity was non-play.

Dramatic play was not equally distributed on the structures. On the upper playground the highest amount of dramatic play occurred in the lower houses (5.3 percent) and the upper houses (4.8 percent) of the play structure (see Table 2). On the lower playground, the bridge and the platform were the sites of the most dramatic play (8.7 percent and 4.1 percent, respectively) (See Table 3). Functional play also occurred at each of these locations as well as on other parts of both the upper and lower playground. The highest amount of functional play occurred on the bridge (16 percent).

Turning to interaction behavior, positive social interaction was seen 59 percent of the time and solitary play was noted 29 percent of the time. Parallel play accounted for 7 percent of the social interaction, and negative interaction was observed 5 percent of the time.⁵ Positive social interaction occurred most frequently on the bridge and platform of the lower playground structure (15.8 percent and 10.6 percent, respectively), and on the upper playground in the upper houses (6.9 percent), lower houses (7.2 percent) and the upper house threshold (6.8 percent). The highest amount of solitary play was on the platform (5.6 percent) and the bridge of the lower playground (4.9 percent) (see Tables 2 and 3).

Discussion

Children used the playground structures for both functional and dramatic play but the majority of the play was functional in nature. This is not surprising since the playground equipment is designed to engage children's gross motor skills. Functional play was seen on all areas of the structures but certain design features seemed to be especially conducive to gross motor activity. These were elements that enabled children to transfer from one portion of the equipment to another (i.e., bridge, long pole, and stairs). Multiple origin and destination points for such transition elements most likely further enhance their use for this activity.

On the other hand, dramatic play was seen only at specific locations on the equipment. The design features that facilitated dramatic play were enclosed spaces (the upper and lower houses), nodes and connector spaces (threshold, platform,

⁵ The low amount of negative play can most likely be attributed to the philosophy of the day care program, which consistently encourages children to exhibit positive social interaction. The school also has a higher than average teacher/child ratio, one teacher to five children, as compared to a minimum of 1:7-1:9 required by New York State Office of Children and Family Services (http://www.ocfs.state.ny.us/main/beecs/regs/418-1_CDCC_regs.asp#s8).

and net), and stage-like places (the bridge). These locations easily accommodated two to three children, making them ideal places for the cooperative social interaction that is necessary for successful dramatic play activities. The enclosed areas provided a space where a small group of children could play without being disturbed, making it possible to carry out uninterrupted dramatic play themes. Studies have found that positive interaction and more complex use of language among preschool children is supported by enclosed areas that are part of play structures (Brown and Burger 1984; Kruidenier 1978; Gramza, Corush and Ellis 1972). On the playground in our study the enclosed areas contained benches and a table, which may have facilitated children being able to use various objects to help them carry out their play themes. The bridge that sometimes functioned as a stage provided children the opportunity to perform for their peers and it was also able to accommodate several children at one time.

Design features that did not facilitate dramatic play were spaces oriented to the rear of the structures that were isolated, and had only one way in or out. If spaces were not highly visible, perhaps children were not able to note possible play opportunities. Spaces with only one way in or out may have been perceived by children as dead-end spaces, or the spaces created discomfort from crowding or congestion.

The play structures did not encourage constructive play. The equipment, like most play structures, was static and offered little opportunity for children to alter or change it. Children were observed trying to add to the structure by using a ladder or rope but the equipment could not be re-configured. Two critical features of the environment that support constructive play are manipulation and differential feedback (Evans, Kliwer and Martin 1991). Sand and water are perhaps the prototypical examples of manipulative play. The opportunity to mold, reconfigure, to change the environment is an important ingredient of more sophisticated play behavior. Differential feedback implies responsiveness to the initiator that is dependent on user choices. The environment responds variably according to what the child does—different actions lead to unique experiences. Perhaps the most fundamental ingredient for developing competence in the young child is awareness and expectation that one's own actions can make a difference in what happens to the self.

Although the structures investigated in this study provided children with many different play opportunities, most of the play behaviors were functional. Supporting functional play does not necessarily mean that dramatic and constructive play cannot also be supported. Children are often most attracted to outdoor play environments that support social interaction, functional, and dramatic play (Naylor 1985). For example, a wooden fort can be the setting for dramatic play themes, a social meeting place, and used as a climbing structure. In this study we have seen that certain design features support dramatic play; namely, spaces that comfortably accommodate two to four children, nodes and connectors, multiple access/egress points, and spaces that are highly visible by the children. Constructive play, when it occurred, was supported when children could bring loose parts to the structure.

Study II

The first study identified specific features of playground equipment consistently associated with higher order play behaviors. More dramatic play occurred in areas that were enclosed, highly visible, fit two to three children, and had multiple entries and exits. The use of props also seemed to be correlated with dramatic play. Other research has had similar findings; dramatic play occurs more on playgrounds that contain enclosed areas and equipment (i.e., "loose parts") that can be manipulated (Frost and Campbell 1985).

Our second study examines more closely the relation between types of play and attributes of the outdoor play environment, namely, the presence of loose parts. Instead of comparing playground types, loose parts were introduced to an existing playground to determine what effect, if any, this addition would have on children's play behaviors. We used observational methods that tested the effects of "loose parts" on types of play behavior and social interaction. More specifically, we designed the study to examine how loose parts would affect place-making play behaviors and dramatic play. Since dramatic play seems to be more likely to occur in spaces with specific features (enclosed, partially enclosed, identifiable boundaries), in the second study we wanted to provide children with place-making opportunities to see how these places might be created and then used for dramatic play.

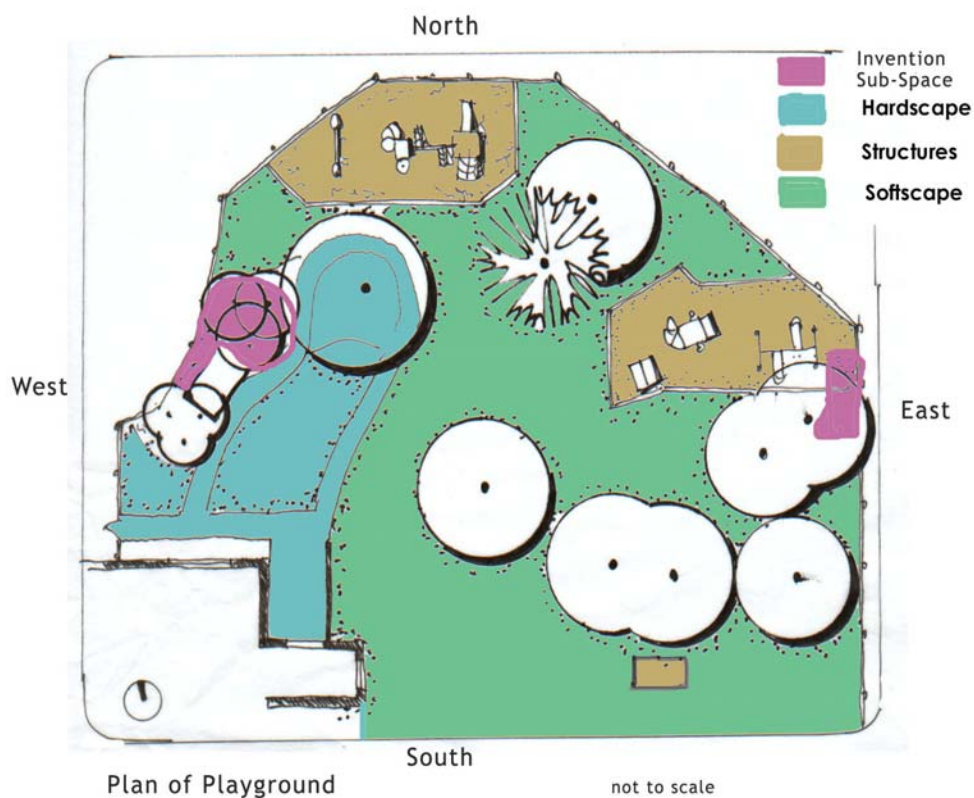
Study II used a repeated measures design. Children were observed in three phases: a pre-treatment phase, a treatment phase, and a post-treatment phase. We took both quantitative and qualitative measurements.

Participants

Two classrooms of 16 children each were observed from the same university-based laboratory day care program observed in Study I. None of the children who participated in the first study were part of the second study. Children's ages ranged from 48 months to 60 months ($M=54$ months). Each classroom contained equal numbers of boys and girls. Again, we observed the children on the playground during outdoor free play.

Setting

For this study, we only used the lower playground since it was larger than the upper playground and contained two separate but similar spaces for our installation in the treatment phase. The playground was conceptually divided into four areas for the purpose of analysis (see Figure 3). The areas were based on physical features and use of the space: 1) the east and west intervention areas (purple), 2) the hardscape or paved areas (blue), 3) the softscape or grassy hill and wooded areas (green), and 4) the areas with wooden structures (brown).

Figure 3. Plan of playground indicating intervention areas

The east and west intervention areas of the lower playground were chosen as the installation areas because they had several common attributes. One, they were both highly visible areas; two, they were similar in scale; and three, they were both relatively underused by the children. It was important that each of the areas for the installation have similar conditions so that they could be compared to each other. Another determining factor was that both areas could facilitate children's place-making since each contained a vertical surface that might function as an anchor for a partially or completely enclosed space. In Study I, dramatic play was most often observed in bounded spaces on the play equipment. Such spaces were either enclosures (the house-type places), places with specific boundaries such as the bridge that seemed to function as a stage, or destinations such as nodes or platforms. These were places where children could gather and create play scenarios for dramatic play. Study II investigates whether providing children with loose parts in order to fabricate spaces will encourage them to create their own places (enclosures, places with boundaries, destinations) in order to facilitate dramatic play.

The Intervention

The west intervention area is a small space with a few trees that is located on the north side of the shed. A chain-link fence defines the border to the west and a paved pathway defines the eastern edge. The ground is covered with wood chips

(see Figure 4). The east intervention area has a chain-link fence to the east and a small tree on the west side that defines the space. The ground cover on half of this space is sand. The other half of the space is adjacent to the wooded area, where the ground is mud and grass. The space includes a u-shaped tree stump and several smaller movable logs. The fence and stump provide natural place-making areas (see Figure 5).

Figure 4. The west intervention area as it existed prior to the intervention



Figure 5. The east intervention area as it existed prior to the intervention



During the treatment phase, we added “loose parts” to both the east and west intervention areas. In the west intervention area, we added 15 large Styrofoam blocks (24" x 12" x 8"), three pieces of fabric (5' x 8'), five tires, five tree stumps and PVC pipes.⁶ The materials were lightweight and could easily be taken down and rearranged (see Figure 6). In the east intervention area, we added materials similar to those used in the west intervention area. Fifty Little Tykes® plastic blocks (12" x 4" x 3") were substituted for large Styrofoam blocks. The blocks differed in size and were bright red, yellow or blue (see Figure 7). Prior to the study, for several days we informally observed children playing with the loose parts to ensure that they would be able to move and manipulate them and to see if the materials were durable.

Figure 6. The west intervention area with large building materials added



⁶ PVC pipe—Polyvinyl chloride pipe—is a common plastic pipe used for plumbing installations. However, since it is a pipe that can be connected in a variety of configurations it is often used for children's projects.

Figure 7. The east intervention area with small building materials added

On the first day of the treatment phase, we arranged the blocks in both invention areas to form walls to give children the idea that they could use the loose parts to build spaces. We attached the fabric to the fence, shed, and bushes with hooks to form a roof. The tires, tree stumps and PVC pipes helped the children to form a "space."

Procedures

The three-phase study was conducted over a seven-week period from March to mid-May. During the first two weeks, pre-treatment, we observed the children on the playground with no installation. We added the loose parts to the playground a week before our observations began so that the children could become accustomed to the new features. In the treatment phase, weeks four and five, we observed the children with the installation in place. We removed the installation for the sixth and seventh weeks, the post-treatment phase. We used a condensed, seven-week time frame in order to minimize the effects of maturation so that any observed changes might be reasonably attributed to the installation. The seven-week time period was also chosen to reduce dramatic fluctuations in weather. Throughout the duration of the study all other elements of the playground remained constant.

We observed children Monday to Friday between 12:00 pm and 1:00 pm, in random order for a total of three minutes at a time. Since the two classrooms alternated their play on the playground, children were either observed Monday, Wednesday, and Friday (12 times per day), or Tuesday and Thursday (18 times per day). Each child was observed a total of 36 times per week for a total of six weeks. As in Study I, we observed type of play behavior (functional, constructive, dramatic/ fantasy, or

non play), type of social interaction (solitary, parallel, positive interaction, or negative interaction). Location on the playground and use of props were also recorded. There were a total of 6,912 separate observation records. As mentioned above, inter-rater reliability was very high. Observers noted the date, temperature, and the weather conditions (rain, sun, cloudy, or snow) at the beginning of each observation period.

We also collected qualitative data during the treatment phase of the study.⁷ Detailed field notes, including children's conversations and what they did with the props, were recorded in the east and west intervention areas during the treatment phase. Two observers simultaneously observed each space for 15 minutes each on eight occasions. Observations were taken from about ten feet away from the spaces, close enough to hear children's conversations, but not too close to disrupt play. Observers recorded their field notes by hand in a small notebook and transferred them to a computer the same day to insure accuracy. We also used photographs and sketches to record children's use of props.

We investigated the following three hypotheses. One, more constructive play will occur when children are provided with supportive loose parts. Two, children will use these loose parts to construct spaces where dramatic play themes will be explored. Three, given a choice between spaces with loose parts or play structures, children will be more likely to play in spaces with loose parts.

Results

We used the general linear model for all analyses. Our findings supported the first hypothesis. There was a main effect of location for constructive play ($F(3, 124) = 3.72, p < .02$) (see Table 4). During the treatment phase when children were provided with loose parts in the east and west intervention areas, children engaged in more constructive play in those areas than in the softscape and structure areas where loose parts were not provided. In addition, we found a main effect of location for space-making loose parts props ($F(3, 124) = 43.31, p < .000$) in the treatment phase. Space-making props were more likely to be used in the west and east intervention areas when compared with the non-intervention areas of the playground (see Table 5).

⁷ We collected qualitative data during the treatment phase to better understand how children played with the loose parts. However, budget constraints of the project did not permit this level of detail to be collected during the pre- and post-observational periods.

Table 4. Percentage of time children engaged in constructive play across the playground during the treatment phase

<u>East and West Intervention Areas</u>	<u>Softscape^a</u>	<u>Structures^b</u>	<u>Hardscape^c</u>
14%	8%	5%	0.5%

Notes

- a. Softscape = grassy and hill area
- b. Structures = wooden play structures
- c. Hardscape = paved area

Table 5. Percentage of time props were used for space-making during the treatment phase

<u>East and West Intervention Areas</u>	<u>Softscape</u>	<u>Structures</u>	<u>Hardscape</u>
51%	4.5%	2%	0.5%

Our findings also supported our second hypothesis ($F(2, 62) = 13.96, p < .000$). During the treatment phase, children used the loose parts provided in the west and east intervention areas to construct spaces (see Table 6). Play increased in these areas during the treatment phase when loose parts were provided ($F(2, 62) = 18.72, p < .000$) (see Table 7).

Table 6. Percentage of time children spent in the east and west intervention areas using space making loose parts props across all phases

<u>Pre treatment</u>	<u>Treatment</u>	<u>Post treatment</u>
0%	3.4%	0%

Table 7. Percentage of time children spent in the east and west intervention areas across all phases*

<u>Pre treatment</u>	<u>Treatment</u>	<u>Post treatment</u>
1.5%	7.1%	0.8%

* Percentage of total observation across all four areas of the playground.

We investigated our third hypothesis by calculating where children played during the entire course of the study. Since the size of each of the areas was different, the percentage of time spent in the space was divided by the square footage of the space. Using this transformed variable, there was a main effect of location for each phase. In the pre-treatment ($F(2, 62) = 98.87, p < .000$), and post-treatment phases ($F(2, 62) = 42.66, p < .000$) children were most likely to be found in the

structure area (see Figure 3). However, during the treatment phase, children were more likely to be in the east and west intervention areas where the loose parts were located ($F(2, 62) = 15.44, p < .000$) (see Table 8). There was no main effect or interaction with any of the variables of interest for gender.

Table 8. Percentage of time children were found in each playground area

	<u>Pre treatment</u>	<u>Treatment</u>	<u>Post treatment</u>
East and West Interventions	.01	.49	.01
Structure	.31	.19	.24
Hardscape	.10	.12	.17
Softscape	.02	.02	.02

Analysis of Qualitative Data

Observers collected qualitative data in the form of field notes only during the treatment phase of the project, so no comparisons can be made with the pre- and post-treatment phases. However, analysis of these notes provides a detailed look at the children's play activities with the loose parts. Since the field notes included children's conversations, these data provide a window to the complexity of children's play activities that may not be captured through the quantitative coding alone. Analysis of these notes reveals that children were often engaged in dramatic play in the context of constructive play. In other words, as the following examples show, these play activities occurred together.

Children engaged in dramatic play in the west intervention space in particular. The children would build a "house" or other space and then use it as a setting for dramatic play, as in the following:

"I'm going to build a house," Victoria⁸ exclaims.

"Put that block over there. That's for the table," says Maria.

"Where is the kitchen?" Keelan asks.

"I didn't build it yet. You have to wait. We first have to build the living room and our bed," says Maria.

"Our bed?" Keelan exclaims.

"Yeah, we need a bed to sleep in, right?" says Maria.

⁸ Children's names have been changed.

"Oh, ok. But can I at least build the car. I like cars. I can make a nice, fast car. Vroom vroom!" says Keelan.

"Ok, but you have to help me with the living room. People want to come over tonight and I want to make everything pretty for them," says Maria.

"Flowers are pretty. We can have flowers," says Keelan.

"Ok. We can have flowers to make our house pretty," says Maria.

"I'll go get them now, at the store!! Bye!" Keelan says.

Constructive play involved often stacking blocks and organizing them into spaces or objects, as seen in the following excerpt from the east intervention area. Three children each independently built a tower. They decided to connect the three towers. Once they were connected, the children began trying to figure out what they had built:

"It's a space ship," Dan says.

"No—it's a boat," Jose yells.

"Ok, we need to build some oars," Sara says. Dan goes to get some more blocks to work on the oars. Jose sits in the front and holds on to a 'stepping stone' pretending it is a steering wheel.

"Look—we are driving a train." Dan tells Sara (see Figure 8).

Figure 8. Children building a train in the east intervention area



Constructive play also occurred in the west intervention area. Children used the large blocks to build towers, "houses," "forts," and "zoo cages." In the following example, the children built a high tower with the blocks:

Will is collecting large Styrofoam blocks from under the tent and stacking them on top of one another.

"Wow, it's almost taller than you!" the teacher exclaims.

He stands close to it, and then goes to get another block.

"Now it is taller than you!" the teacher says.

He adds a seventh block. Another boy comes over.

"Cool!" Josh says.

"Don't knock it over!" Will begs.

"I won't," Josh says.

Three more boys come running over to help with the tower building. Noah tries to put a ninth block on the tower. All the boys are trying to figure out how to get another block up. Kieran goes on his tiptoes and gets the ninth block on. He jumps up to try and center it. The teacher helps straighten it. The boys seem pleased (see Figure 9).

Figure 9. Children stacking blocks in the west intervention area



It was evident through children's conversations that they used language to negotiate the use of the blocks. Interactions were primarily positive; however, some negative interactions did occur, usually involving ownership of blocks or space. Social interactions were similar in both intervention areas, although it seemed the children had more problems sharing the large blocks (there were fewer of these blocks) in the west intervention area. They had more success with cooperative building in the east intervention area, which contained smaller, more numerous blocks.

Discussion

The goal of Study II was to examine the effects of loose parts on space making and types of play behaviors. The findings of Study I suggested that dramatic play in outdoor playground settings is associated with specific bounded spaces. These spaces are semi-enclosed areas or have identifiable boundaries that pre-school children understand. In the second study we gave children materials that they could use for space making in order to see how the new spaces might affect the occurrence of dramatic play. The findings indicate that loose parts did encourage constructive play, space making, and most likely dramatic play. As expected, when the loose parts were removed in the post-treatment phase, each of these types of play decreased and overall play in the east and west intervention areas decreased as well. The presence of loose parts made the difference.

The qualitative analysis revealed children's play themes while the quantitative analysis identified types of play behaviors. The design of the study did not permit a comparison of qualitative data across all phases; nevertheless, the qualitative observations helped to provide a clearer picture of how children played with the loose parts we added to the playground during the treatment phase. It appears that dramatic and constructive play occurred simultaneously. Children constructed spaces such as "houses" and "forts" with the loose parts and then carried out various play themes in these constructed spaces.

The field notes documented that during the treatment phase when the loose parts were available, children were most often observed playing with the blocks; however, other props, such as the pipes, were sometimes used in conjunction with the blocks. Children were observed building complex forms such as "space ships," "boats," "zoo cages," and "trains."

Specific features of loose parts seemed to influence the way children played. This is most likely because of the affordances that the play materials offered the children. Affordances are features of the environment that have functional significance for the perceiver or user (Heft 1997). In this case, children perceived that the blocks could be used to build things; the blocks' functional significance for the children was that they were useful for constructive play.

The size and other properties of the blocks suggested different types of construction activities. Children used the large blocks from the west intervention area most often to build spaces such as "houses" and "forts." Perhaps because these blocks were larger, they allowed children to make spaces with less difficulty. Within the spaces

they built, children acted out dramatic play scenarios. The blocks in the east intervention area were smaller and there were more of them. Children playing in this area tended to build more than children in the west intervention area and they most often used the blocks to make models of objects rather than "spaces."

The field notes indicated there was both positive and negative social interaction in the two installation areas, possibly resulting from increased group play. According to the field notes, children often worked together when building. Working together to build an object or space is important for children's development, teaching them to use language to negotiate with one another. Children were often observed teaching one another how to build something. They were also found negotiating over the use of blocks and other props, as in the following example:

"Put them (blocks) here—no, here." Amy points to a location next to the shed.

"Don't do that, no don't stomp on them, they are my packages," Amy says, as Kayla jumps on the blocks. She then takes more blocks and moves them to the 'front yard' by the path. Kayla gets off and grabs her hula-hoop and says, "Don't take those— they are my bed."

"No—the beds are here," she says as she points to another set of blocks. Amy runs off under the tent holding on to her blocks. Jill moves her "packages" into the house.

"No—don't take my packages," Amy says. Kayla lies down and pretends to fall asleep on the 'bed.'

We noted differences in how children played with blocks in the east and west intervention areas. However, because of the study design, it is not clear what features of the blocks led to the differences. The blocks were different sizes, which most likely had an impact on how easily children could build with them. The small blocks were also bright primary colors and the large blocks were white. Children seemed to notice the color and perhaps it influenced thematic play. For example the large white blocks were most often called "beds." Children also showed preferences for (e.g., selecting for or fighting over) certain colors when using the small blocks in certain play episodes. The blocks were also made of different materials. The large blocks were made of Styrofoam and the small blocks were hollow plastic. This also may have led to different uses. For example, children were able to stand on the large blocks, but when they tried to stand on the small ones, the blocks collapsed.

Limitations

Several limitations of the studies are noteworthy. First, observations were conducted at a university laboratory school. This type of school tends to have a higher teacher/child ratio and it also tends to have more highly educated teachers than the typical preschool. Teachers at this school also discouraged negative

behavior. These variables could limit somewhat the generalizability of our data, but cannot plausibly account for the environmental effects observed herein.

Second, there was little opportunity in this study for a good comparison of play behaviors in all areas of the playground. In Study I we focused on the design of play equipment. In Study II children rarely played in the treatment areas (east and west intervention spaces) in either the pre- or post-phases. Therefore, while it was possible to assess changes in children's constructive play on the playground as a whole, it was not possible to do so in the treatment areas. Future research could select playground areas where children currently play, introduce a set of loose parts, and observe potential changes in play activities.

Third, the weather may have affected children's play activities. Although the time period for the study was chosen to minimize major fluctuations in weather conditions, unfortunately the temperature changed considerably during the seven week period (from an average low of 36 degrees F to an average high of 54 degrees F). Children may engage in different activities depending on the outdoor temperature. Observations over a calendar year might help to address this concern. However, when the quantitative analyses were repeated controlling for temperature, the conclusions remain the same.

Fourth, changes in play activities in the treatment areas in Study II could be attributed to the newness of the loose parts added to those areas. Children rarely played in the treatment areas prior to the installation of loose parts. It could be argued that placing anything in these areas would invite children's play. We did take steps to control for the "newness" by installing the loose parts in the treatment areas one week prior to formal observations so that the children could become comfortable with the materials and perhaps have some of the "newness" dissipate. However, the adjustment period, and the total study period, may not have been long enough. If the loose parts were left on the playground for a longer period of time (several months or longer) and then taken away, it might be a better indication of how the materials affected play behavior. The longer study period would permit children to become accustomed to the materials. It would nevertheless be expected that once the materials were removed from the playground that the play behaviors associated with the materials would decrease.

Finally, qualitative observations were not made in all phases of Study II. This limited the ability to make definitive conclusions about how the loose parts influenced dramatic play. The field notes collected during the treatment phase revealed that constructive and dramatic play behaviors often were bound together. However, since similar data were not collected in the pre- and post-phases, we do not know how the loose parts affected this relationship. Future research should collect both quantitative and qualitative data in all phases of a similarly designed study.

Conclusions

Children's playgrounds have been studied from a variety of perspectives. On the basis of the two studies presented here, it appears that children's play behaviors on

playground settings are affected by the physical attributes of the playground. In Study I, children primarily used the structures for functional play activities (e.g., climbing, sliding, or jumping). When dramatic play occurred it took place in specific locations on the equipment: in places that were encapsulated (e.g., the houses), stage-like places (the bridge), and node or connector places (e.g., platforms, net). These attributes of the equipment seemed to facilitate small group interaction which in turn provided the opportunity for dramatic or fantasy play. These locations also support the use of loose parts. Loose parts and encapsulated spaces at preschool children's scale can provide the affordances that children need to engage in dramatic play. Constructive play rarely occurred on the equipment.

Study II used an intervention to further investigate how playground attributes affect children's play behaviors. Children used loose parts for both constructive and dramatic play activities. Children constructed spaces (e.g., a "house," or "car") and then proceeded to carry out dramatic themes in these spaces. The constructed spaces accommodated small groups of children, usually two to four, according to the field notes. Constructing these spaces provided an additional opportunity for children to express themselves through language. They learned to negotiate as well as share, and building with the blocks contributed to the development of their gross and fine motor skills. Blocks, in particular, encourage building skills such as stacking and complex building. Complex building increases children's ability to understand space, scale, and encourages creativity.

Constructive play on traditional playground equipment may be increased by providing a kit of "loose" parts that could be easily and safely used with the basic structure. Such items might include ladders or moveable platforms designed specifically for the equipment. Features that would allow natural elements such as water or sand to be easily incorporated into play themes (i.e., a trough) could also be provided. Additional loose parts could include items similar to those used in Study II described above. Providing children with materials that increase constructive play can be a springboard to increasing dramatic and fantasy play as well.

Playgrounds can provide preschool age children with learning and development opportunities similar to those in indoor settings with the added advantage of exposure to nature and often greater opportunities for gross motor activity. However, care must be taken to ensure that the design of the physical environment will support learning opportunities responsive to children's developmental needs.

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