

Environmental Education

The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children

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INTRODUCTION

Norwegian studies have revealed a disquieting tendency that children are becoming more sedentary in their adolescence. They spend more time, approximately three hours a day, on TV, video, and electronic media (MMI, 1995). The movement pattern of children has changed remarkably the last 10–20 years. The unorganised traditional games, which included lots of moving around, are now changing into sitting in front of your private computer playing computer games. Such scenarios have resulted in several health hazards like increasing obesity in early childhood (Anderson et al., 1998), and motor problems in children are reported in several Scandinavian studies (Due et al., 1991; Hertzberg, 1985; Gilberg and Rasmussen, 1982; Kjos, 1992; Ropeid, 1997). However, a recent study of the physical activity among 3–7 years old Norwegian children (MMI, 1997) showed that 75% of the children spend some time outdoors by their own every day. The most active ones practiced several outdoor activities such as skiing and hiking in the wilderness, climbing trees, enjoying water activities, and soccer in the field. Four out of ten children expressed a wish for more time for physical activity (Hansen, 1999), but children complain about the lack of suitable arenas for play and free time activities, such as grounds for climbing, building dens, sliding, and skiing (Mjaavatt, 1999). Francis (1988) argued that children's play in an unstructured environment, preferably a natural one, gives the children a genuine understanding of reality. Rivkin (1990, 1995) highlights the values of outdoor play, but regrets that children's access to outdoor play habitats are vanishing.

Several kindergartens in the Scandinavian countries

have experienced positive results from being outdoors in natural environments, but only a few studies have been done in this field (Bang et al., 1989; Fjørtoft, 1999; Grahn et al., 1997). We know far too little about how the natural environment functions as a playground for children, and we know even less about what effects such a playground might have on learning in children. The physical outdoor environment, and the natural environment in particular, as a play habitat for children, has been a topic of low priority in child research (Bjerke, 1994).

THE AFFORDANCE OF NATURE

Natural environments represent dynamic and rough playscapes that challenge motor activity in children. The topography, like slopes and rocks, afford natural obstacles that children have to cope with. The vegetation provides shelters and trees for climbing. The meadows are for running and tumbling. Description of physical environments usually focuses almost exclusively on forms. Heft (1988) suggested an alternative approach to describe the environment, which focused on *function* rather than form. The functional approach corresponds better to the children's relations to their environment. Intuitively children use their environment for physical challenges and play; they perceive the functions of the landscape and use them for play. The central concept guiding children's examination of their environment is that of *affordance*. Gibson (1979) developed the concept "affordance" to describe an awareness of the environments and their functional significance, or their functional meaning. For example if a rock is big enough to fit the hand, it might be perceived as an object to grasp or to throw; it affords grasping or throwing. A tree that is appropriately branched and stemmed, will likewise be perceived as climb-on-able; it affords climbing-on. Nature provides an environment with such possibilities and

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affordances. Frost (1992) introduced the concept “play-scape” to describe different play environments. He argued that natural features are important qualities of playgrounds, and that the natural features allow a wide range of learning opportunities not available from other playground options. Hart (1979) and Moore (1986) have described the children’s preferences of wilderness and unstructured landscapes for play.

In Scandinavia it has become popular for kindergartners to spend more time outdoors in the natural environment. Some kindergartens are organized as outdoor schools, where the children, aged three to six, spend all or most of the day outdoors in a natural environment. Playing in a natural environment seems to have positive effects on children; they become more creative in their play, and play activities and play forms are increasing. It is also indicated that absence due to sicknesses is lower among children in outdoor kindergartens than in the traditional ones (Grahn et al., 1997, Söderström, 1998). Not the least it is evident that the children’s motor fitness is improved. They move easily around in a rugged terrain and cope with physical challenges, which improve their motor ability (Fjørtoft, 1999, Grahn et al., 1997). Although few in number, these studies indicate that the natural environment is a stimulating arena for learning in general, and for motor fitness training in particular. The present research corroborates the main findings.

VERSATILE PLAY IN THE NATURAL ENVIRONMENT AND THE IMPACT ON CHILDREN’S MOTOR DEVELOPMENT

Objectives

The notion that versatile play in a natural environment might have an impact on children’s development constituted the background for the present study. The aim of the study was to investigate how children’s playing in the natural environment might stimulate their motor fitness and it was decided to focus on the affordances of the landscape and the correlation for versatile play. The main objectives were, 1) to focus on the affordances of the landscape for versatile play and, 2) to examine the impact of outdoor play activities in children’s motor ability and mastering.

Methods

An experimental study was carried out with five- to seven-year-old children in kindergartens in Telemark, Norway. Because of the lack of randomization, the study

might be characterized as quasi-experimental approach (Robson, 1993, Thomas & Nelson, 1985). The groups were selected from three kindergartens equal in age groups. The experimental group of 46 children from one kindergarten was offered free play and versatile activities in the forest next to the kindergarten. The experimental group used the forest every day for 1–2 hours throughout the year when they attended the kindergarten. Only randomly they used the outdoor playground inside the kindergarten fence. As reference group 29 children of the same age groups from two kindergartens in the neighbouring district were chosen. The groups were checked out for differences in socioeconomic living conditions by multiple regression analysis, using parents’ educational and professional background as variables. The reference group used their traditional outdoor playground for 1–2 hours a day and visited natural sites only occasionally. Both groups had the same standard playground equipment, such as sandpit, a swing, a seesaw, a slide and a climbing house in their outdoor play ground. The study started with a pretest in September. The treatment period lasted for nine months, and was terminated with a posttest in June the following year.

Both groups were tested with the *EUROFIT: European Test of Physical Fitness, the Motor Fitness Test* (Adam et al., 1988). The test included the following test items: Flamingo balance test (standing on one foot) for testing of general balance, Plate tapping (rapid tapping of two plates alternatively with preferred hand) measuring the speed of limb movement. Sit and reach expressed flexibility in knee and thigh joints. Standing broad jump (jumping for distance from a standing start) measured explosive strength. Sit-ups (maximum numbers of sit-ups achievable in half a minute) measured trunk strength. Bent arm hang (maintaining a bent arm position while hanging from a bar) for testing of functional strength in arm and shoulder, and Shuttle run (a running and turning, shuttle, test at maximum speed) testing running speed and agility. Two additional tests were introduced: Beam walking for testing dynamic balance and Indian skip (clapping right knee with left hand and vice versa), which tested cross coordination (Fjørtoft, in press).

Data analyses were performed according to the statistical programme SPSS/PC+, the PC version of the Statistical Package for the Social Sciences (Norusis, 1993; Frude, 1993). Frequency analyses, means and the T-test for independent samples and paired samples, correlations; multiple regression analyses and factor analyses were applied for data processing (Fjørtoft, in prep.). In this article the main findings of the study will be presented.

Results

The Study Area

The site of the investigation was a small forest of 7.7 hectares of mixed woodland vegetation, located close to a kindergarten in Bø, Telemark County in Norway. The landscape pattern showed a mosaic of patches of woodland with some open spaces of rocks and open fields and meadows in between. The topography, expressed as slope and roughness, was varied with some steep cliffs, slopes, and plains. Vegetation and topography jointly afforded a diversity of play habitats for the children (Fjørtoft & Sageie, 2000). The forest was located outside the fence and behind the kindergarten (Figure 1). In the closest parts the children were allowed to go at will, but in the farther parts the children had to be accompanied by adults.

Play Habitats

The children more frequently used some favorite places in the forest. These play habitats were located close to the kindergarten and represented specific play habitats for summer and winter play activities (Fig. 2). The play habitats used in the spring, summer and au-

tumn time were all located behind and above and close to the kindergarten area. This area included 5 different types of woodland, the low-herb woodland being the dominant type of vegetation, see Figure 2. The mixture of woodland types represented a high diversity in vegetation elements.

The variety of woodland vegetation and the physiognomy of trees and shrubs in the area made the affordances for play and play habitats an offer of multiple choices. The shrubs constituted a mixture of scattered species, which afforded shelter and hiding, social play, and construction play. Very special was the flexible juniper bush, which motivated for functional play (how to get in and out) and social play (play house) as well. Some trees were suitable for climbing depending on the branching pattern, the stem diameter, and the flexibility of the tree. The young deciduous trees were easily accessible for climbing (Figure 3).

The spruces were more suitable for hiding than for climbing due to the dense branches. The more open areas in the pine and low-herb woodland afforded running, chase and catch, leapfrog, play tag, and other games that an open space can afford. The shrubs afforded hide-and-seek, building dens and shelters and role-play like house-and-home, pirates, fantasy, and function play (Figure 4).



Fig. 1. The kindergarten and the forest.

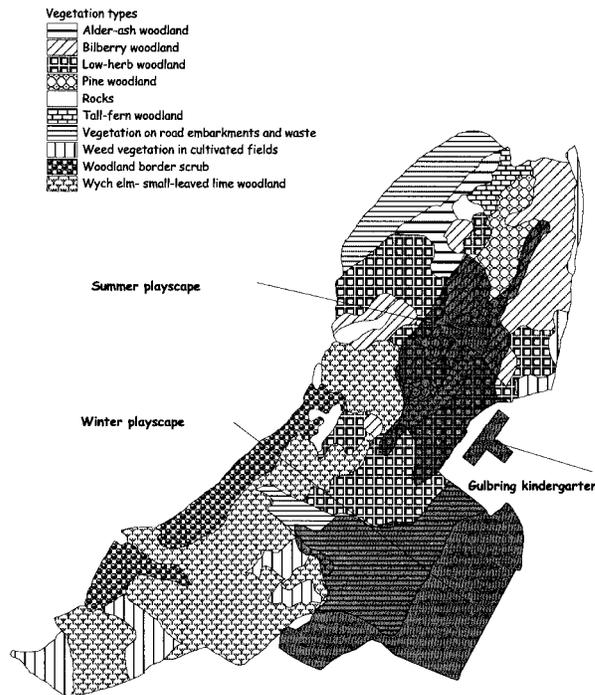


Fig. 2. The forest. Vegetation map. Playscapes indicated by grey color.

The topography was undulating with terraces and slopes and a dominant cliff traversing the area, which afforded slopes for sliding and cliffs for climbing (Figure 5).

The children's favorite places were named "The Cone War," "The Space Ship," and "The Cliff." The naming itself is illustrative for the activities taking place there. Free play fostered creative play, and the playscape afforded loose parts and natural objects and materials to play with. Play activities were observed related to the affordances of the vegetation and the topography (Fjørtoft & Sageie, 2000).

The play habitats in the forest were also used during the wintertime, but their functional use was different. The cliff turned into sliding slopes of different categories. With appropriate clothing with oilskins (trousers for wet climate), the children made high-speed competitions in different sliding disciplines: on their backs, on their stomachs, feet first, head first, and so on. The steep slope afforded shorter but more challenging rides. The deep snow provided affordances for tumbling, rolling, and other acrobatics. A dense snow layer made the trees more accessible for climbing. The play categories in the forest during the winter season can be categorized as functional play (climbing, crawling, making angels in the snow, etc.), role-play like play house, construction

play like building snow figures and dens. The genuine winter habitat was a meadow located next to the kindergarten and comprised a soccer field and the lower parts of a ski jump arena (Figure 2). These fields were used by the kindergarten almost solely as a skiing arena in the winter. For children at the age of 5–7 years the more gentle slopes of the ski-jump arena were used for different skiing disciplines (Figure 6).

Motor Ability

The groups matched in age with a mean age of 6.1 years and there were no significant differences in age between the groups. It was the six-year-olds that dominated both groups. The sex distribution in the groups showed a predominance of boys in the experimental group (27 boys, 19 girls), while in the reference group there were more girls (18 girls and 11 boys). There were no significant differences in test results between the sexes. Body mass and height did not show any signifi-



Fig. 3. Climbing trees.



Fig. 4. Hiding and role-play.

cant differences between the groups, neither between the sexes. Multiple regression analyses correlating test results with background variables, such as parents' education and profession, showed that these variables had no significant influence on the test results (Fjørtoft, in prep.).

During the trial period a gradual improvement in motor ability was observed in the experimental group. The children became strikingly better at mastering a rugged ground and unstructured landscape. The impact of the environment on the children's motor ability was documented in the motor fitness tests. Table 1 and Figure 7 show the main test results of motor development in the groups.

At the pretest the reference group scored better than the experimental group (Table 1). At the posttest the experimental group had caught up with the reference group and significant differences between the pre- and posttest in all the test items except for flexibility (sit and



Fig. 5. Climbing rocks.



Fig. 6. Ski-jumper.

reach) were found within the experimental group. The improvement within the reference group was not as striking (Table 1).

Comparing the groups at the posttest, significant differences in favor of the experimental group were found in the Flamingo balance test ($p < .001$) and the Indian skip coordination test ($p < .01$). Figure 7 shows the interference effects from pre- to posttest in both groups, showing a significant better improvement in the experimental group in those two items.

DISCUSSION

This study has described the relationship between the structure and functions of a natural landscape, its affordances for play, and the impact on motor development in children. A significant relation between the diversity of the landscape and the affordance of play was indicated (Fjørtoft & Sageie, 2000). As described by Gibson (1979) the affordances of a landscape are what it offers the child. As the child perceives the functions of a landscape and uses it for play, the landscape might have a functional impact on children's behavior and play performance. As maintained by Moore and Wong (1997) the physical diversity increases the opportunities for learning and development. This was also verified by the findings of the present study. The motor fitness tests showed a general tendency that the children using the forest as a playscape performed better in motor skills than the children on the traditional playground. At the

Table I. Pre- and posttest. Mean results (SE) within the groups SPSS T-test for paired samples

TESTS	EXPERIMENTAL GROUP		REFERENCE GROUP	
	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST
FLAMINGO (no. of instabilities in 30 sec.)	4.7 (0.8)	1.5 (0.3)***	4.0 (0.6)	3.3 (0.7)
PLATE TAPPING (Time in sec. of 50 taps)	35.0 (1.9)	28.1 (1.2)***	29.9 (1.1)	27.4 (2.6)
SIT AND REACH (cm)	24.9 (0.8)	24.4 (0.8)	25.3 (1.0)	25.5 (0.9)
STANDING BROAD JUMP (cm)	102.8 (2.9)	113.1 (3.6)***	103.1 (4.3)	111.3 (3.8)**
SIT-UPS (reps. in 30 sec.)	5.3 (0.6)	6.5 (0.6)**	5.9 (0.8)	7.0 (1.1)
BENT ARM HANG (sec.)	2.6 (0.4)	7.0 (1.0)***	2.6 (0.6)	5.4 (1.1)***
BEAM WALKING (sec.)	11.4 (1.4)	7.5 (0.7)**	7.7 (0.8)	7.2 (1.1)
INDIAN SKIP (reps. in 30 sec.)	21.8 (2.2)	43.6 (1.9)***	27.8 (2.4)	37.2 (1.8)***
SHUTTLE RUN (sec.)	31.9 (0.7)	29.7 (0.5)**	30.7 (0.8)	30.3 (0.7)

** = $p < .01$, *** = $p < .001$.

pretest the experimental group started lower than the reference group, but scored better in all test items at the posttest (Table 1). This result makes it highly desirable to make causal inferences, and according to Robson (1993), when there is statistical significance, it is reasonable to conclude that it is the independent variable (playing in the forest), which have affected the dependent variable (motor fitness). This amplifies the impression that the experimental group improved more during the intervention period than the reference group. Significant differences were noticed between the experimental group and the reference group in balance and coordination at the posttest as illustrated in Figure 7. Growth and maturation in the children may have affected these results. The anthropometrical measurements, however, showed no differences between the groups, neither did age and sex. It should therefore be reasonable to consider the gain in motor fitness in the experimental group to be related to versatile play in a stimulating playscape. Whether these effects might have been influenced by

other variables such as leisure activities, were outside the control of this study. However, the parents' socio-economic background did not have any influence on the test results and there was no reason to anticipate one parent group being more active outdoors than the other. It is generally accepted that people in the countryside in Norway have similar opportunities for leisure activities and there is a somewhat democratic distribution of attendance to sports and leisure activities in the population (Wichstrøm, 1995).

A study carried out by Grahn et al. (1997) showed a similar correlation between the physical playscape and motor abilities. The study design was more like a case study including two kindergartens with different outdoor playgrounds. One kindergarten had access to natural environment within the playground area while the other kindergarten had a more traditional urban playground. *The EUROFIT Motor Fitness Test* was applied and the results showed a significantly better performance in the natural play area group than the traditional group. Grahn's study supports the findings of the present study and jointly the two studies indicate the positive impact of the natural environment on children's motor development. Playground studies confirm the significance of diversity in play equipment on children's play behavior. The more equipped, the more versatile and creative the play (Frost & Sunderlin, 1985, Frost, 1992), and Moore and Wong (1997) observed that the repertoire of children's behavior broadened enormously with the increase in physical diversity of the environment. Analysis of landscape ecology and topography for the study area described a varied and diverse playscape, and the study showed a strong relation between landscape structure and play functions (Fjørtoft & Sageie, 2000). The study of Titman (1994) also confirms the children's needs for green grounds, trees to climb and shrubs for shelter and

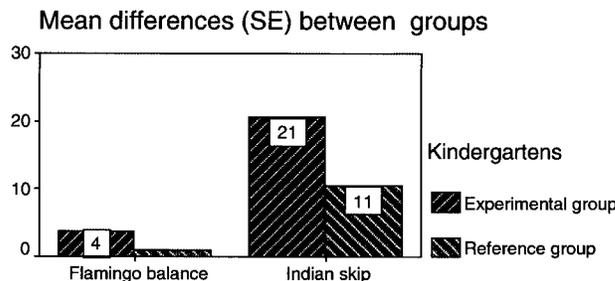


Fig. 7. Interference effects. Pre- posttest results.

Flamingo balance: Exp. group: 3.8* (0.3), Ref. group: 0.9 (0.6). Indian skip: Exp. group: 20.6* (2.2), Ref. group: 10.5 (2.1). * = $p < .05$ (2-tailed).

building of constructions. A natural landscape is synonymous with an enriched environment, which again stimulates and promotes play and learning (Rivkin, 1995). Results from the present study add information to the significance of outdoor arenas, the possibilities for physical play, and the impact on children's development.

CONCLUSION

This study has indicated the relation between versatile play in the natural environment and the impact on motor fitness in children. Significant effects were found in balance and coordination abilities. These are competencies that are of great importance to the children's general mastering of their own body in relation to the physical environment. There is a strong relation between the structures of the landscape and the functions of play. The forest itself represents an environment for play and learning that stimulates motor development and fostering in children. Referring to Bjerke (1994) we still know too little about the learning effects from the natural environment, and more effort should be dedicated to further studies in this field.

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