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Original Article

Outdoor activities and motor development in 2–7-year-old boys and girls

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Abstract

Problem Statement: Parents of young children favor indoor activities for their children, because staying inside supports comfortable daily routines in the family timetable, safety issues and clothing. However, playing outdoors supports children's development, offering multiple challenges to overcome and the possibility to learn new skills. **Approach:** Based on Gibson's theory of affordances (1977), outdoors can be seen as an excellent learning environment for children to reach the zone of proximal development (Vygotsky, 1987). **Purpose:** This paper describes Finnish nature and four seasons as an environment to support children's motor development and inspire outdoor playing. The Skilled kids participants (N= 1136, 2- to 7-year-old children) were chosen by cluster randomization from childcare centers representing young children's motor competence in geographically different parts of Finland. Children's motor competence was measured with the Test of Gross Motor Development, TGMD-3 (Ulrich, 2019). **Results:** Young children living in countryside and in small cities had better motor competence and spent more time playing outdoors than children living in metropolitan area. This difference in the amount of outdoor play and the motor competence underlines the importance of outdoor facilities. The description of the Finnish outdoor environment, such as forest, water, snow and ice, reveals environmental factors that may attract and motivate children to challenge their motor abilities. Therefore, the environment can support physically active playing, increasing young children's overall physical activity and motor competence. **Conclusions:** Versatile environments stimulate children's motor development. Parents and teachers of young children should be encouraged to let their children play outdoors during all seasons in different weather conditions. Appropriate clothing guarantees free playing, daily timetables in day care should allow outdoor playing sessions, and outdoor play yards should have large area with different affordances for children's free use.

Keywords: Motor competence, Children, Outdoor playing, Environment, Physical activity

Introduction

The World Health Organization (WHO) guidelines for young children (2019) state that children should have opportunities to participate in a range of developmentally appropriate, safe and enjoyable play-based physical activities. The guidelines suggest that children 5 years or less should be physically active for at least 180 minutes in any intensity throughout the day. These guidelines are based on research findings that show that physical activity is associated with better motor and cognitive development, psychosocial, cardio-metabolic, bone and skeletal health and reduced risk of injuries. (World Health Organization [WHO], 2019.)

Physical activities are developmentally appropriate when an individual's skill level settles to the zone of proximal development (Vygotsky, 1987). This zone describes the skill level where the child can manage with someone's help, but the task is too difficult to manage alone. Playing in the zone of proximal development is sufficiently challenging and enjoyable, and therefore it supports progression in development (Vygotsky, 1987). From the motor development point of view, a challenging physical environment can create developmentally appropriate zones for motor learning.

The theory of affordances (Gibson, 1977) suggests that significant environmental properties have a crucial role in developing skills. Therefore, these affordances i.e significant properties in physical environment, can stimulate motor development (Fjortoft, 2001; Kyttä, 2002). During outdoor play nature offers multiple affordances to lead children's motor skill levels toward the zone of proximal development.

The aim of this research project was to find out if playing outdoors in a Nordic environment is associated with young children's motor competence.

Materials and methods

Description of research environment: The research was conducted in Finland (5.5 million inhabitants), which belongs to the Nordic countries that have solid outdoor cultures. There are four distinct seasons and great seasonal variations in temperature and the amount of daylight in Finland (Niemistö et. al., 2019). Finland has geographically distributed highly populated metropolitan area (South), cities and rural areas between lakes and

forests (Middle) and less populated small towns, rural areas and countryside (mainly in the northern part of the country). The Finnish environment is known for a vast number of lakes (n=168,000) and forests (total 220,000 km², 72% of the total area). Characteristics of the Finnish environment offer multiple affordances for children's play to develop motor competence. Finnish weather conditions, such as sunshine, rain and snow, together with landscape with forests and lakes, create a fascinating learning environment.

Forest: Picture 1 concretizes the multiple affordances the forest offers to children. For example, different trees are attempting to balance, climb, hang off and throw. Stones of different sizes attract to balance, jump, climb, carry, push and pull, as well as throw. Water in the forest makes an exciting place to jump over or a place to release sticks and leaves to float. (Picture 1)



Picture 1. Forest offers lot of affordances

Lakes: Natural water in lakes and rivers offers interesting sensorial stimuli; when moving in water, the water's temperature and pressure are recognized in the skin. Water activities stimulate first perceptual-motor activities and enhance mainly manipulative skills supporting fine motor development. If adults encourage children to walk until the water reaches hip level, the possibility of learning aquatic skills increase, and learning swimming skills begins. Swimming needs the ability to coordinate whole body segments (such as arms, legs, trunk and head) in a rhythmic way. Playing with different large floating equipment challenges children's balancing skills. (Picture 2)



Picture 2. Water activities stimulate children's senses

Snow: Soft white snow provides an excellent mattress for playing. Climbing to the top of 'snow hills' and rolling or sliding down is excellent practice for locomotor and balancing skills. Running in the snow is exhausting, but it is so lovely to relax, while making snow angels. Snow as a free material challenges manipulative skills, because children can use all their imagination when building snowballs, castles and different characters. Skis, sleds and toboggans develop children's balance and body coordination. (Picture 3)



Picture 3. Snow offers a stimulating environment to challenge motor coordination

Ice: Ice creates a slippery surface to challenge children's balance. Walking and sliding on the ice strengthen children's leg muscles while they try to keep their balance, specifically keeping the centre of the gravity above the support point. Decreasing the size of the supporting area inspires children to try different equipment like skates, skis and toboggans. Moving on ice supports the development of balancing skills that are prerequisites of advanced locomotor skills. (Picture 4)



Picture 4. Ice challenges balancing abilities

Weather: Weather conditions are typically seen as barriers to go out. However, the different weather conditions can be seen as interesting affordances as well. Sunshine can be too hot, but early in the mornings and later in the evenings, shadows are interesting stimuli for playing, imitating and making funny shapes. These activities teach children body coordination.

Raining makes nice water ponds (water puddles) to jump in or over, attracts children to throw little stones or to carry the water to another place. Rain makes the sand in sand boxes an easy material to make sand cakes. Interestingly, children love to catch water drops in their mouths. When children have appropriate clothing allowing them to use their hands freely, the rain is no reason to stay inside. (Picture 5)



Picture 5. Raining is not an excuse to stay inside

Participants: The participants of this Skilled Kids study were 1,136 children (age 2-7-years-old) attending early childhood education (ECE) in randomly selected child care centers ($n=37$) around Finland. The children's parents completed the questionnaire by answering questions concerning their child's behaviour, such as the amount of outdoor play and participation in organized sport. During typical ECE days, children play outdoors twice: one hour in the morning and one hour in the afternoon. Two-hour daily outdoor play sessions in the ECE yard might affect children's motor competence, and therefore the size (m^2) and characteristics (shape and number of surfaces) of the ECE centre's yard were measured (Sääkslahti et al., 2019.)

Motor competence: Children's motor competence was measured by the Test of Gross Motor Development, third version (TGMD-3; Ulrich, 2019). Locomotor skills were measured as movement skills, including three to four items to fulfill for running, galloping, hopping, skipping, horizontal jumping and sliding. Object control skills were measured as ball skills, including three to five items for two-hand striking, one-hand striking, dribbling, catching, kicking, underhand throwing and over hand throwing. Researchers observed each child's performance twice and analyzed the presence (1 point) or absence (0 point) of each item. The sum of movement skills (max. 46 points) and ball skills (max. 54) created the TGMD-3 gross motor index (max. 100 points). Motor skills were measured by researchers during typical ECE day in centre's own gym (Niemistö et al., 2019).

Descriptive statistics (M , SD and %) are used to describe the data. To analyze the differences between gender, geographical locations and residential density in motor competence, the time spent outdoors and participation in organized sports, a linear mixed effects model was used. Hierarchical linear regression models were used to measure associations between individual behavioural characteristics and motor competence. (Niemistö et al., 2019; Niemistö et al., 2020; Sääkslahti et al., 2019).

Results

Children's motor competence varied between different parts of Finland (Figure 1 and 2). Girls' movement skills were somewhat similar in different parts of Finland, but the girls living in the metropolitan area had lower ball skill levels than girls living in the other parts of Finland. The metropolitan girls had a lower gross motor index than the other girls (Figure 1).

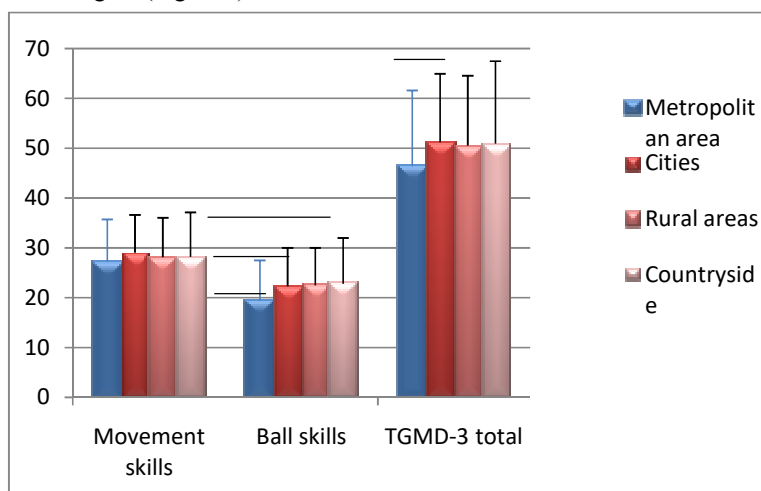


Figure 1. Girls' motor competence based on residential density.

Boys' living in the cities had the best movement and ball skills, when compared to the children living in other environments. Boys living in metropolitan area had the lowest skill level compared to the other boys (Figure 2).

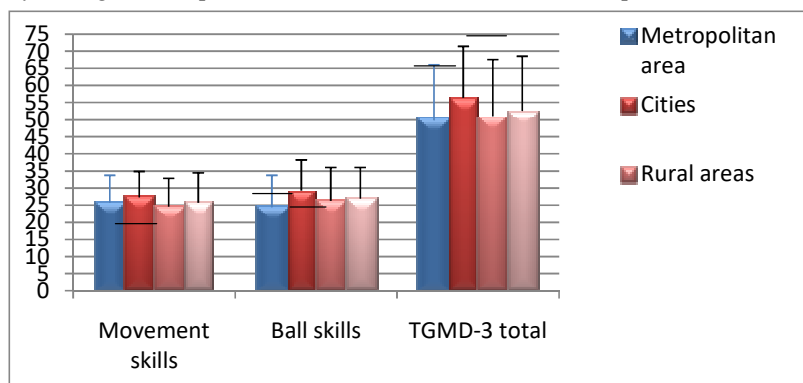


Figure 2. Boys' motor competence based on residential density

Older children had better motor competence ($p < .001$). Some genetic factors were seen in children's motor competence, because the earlier the child learned to walk independently, the better movement skills s/he had ($r = -.178$; $p = .005$). Gender differences exist in children's motor competence, because girls had better movement skills ($p < .001$), and boys had better ball skills ($p < .001$) compared to each other. The children living in metropolitan area were less motor competent than the children living in cities and the countryside, even though they participated most often in organized sport activities (Niemistö et al., 2019).

In this study sample, we found variation in ECE facilities, because 32% of ECE centers did not have their own gym, and the playground size varied substantially (from 226m² – 11 000m²). More than half (54%) of ECE centre, had access to forests. Yard characteristics were associated with children's motor competence, showing that the larger the ECE yard, the better ball skills children had. Also, the amount of different surfaces were associated, because the fewer surfaces, the better movement skills children had. Interestingly, the more different kind of shapes, the less advanced movement skills children had (Sääkslahti et al., 2019).

The amount of outdoor play: After their ECE day, children played outdoors for approximately 30 to 60 minutes on weekdays. Only 3.4% of children did not go outdoors after their ECE day. During weekends, the children played for approximately 60 to 120 minutes outdoors (Niemistö et al., 2020).

Even though the children's physical environment for outdoor play seems to be important, it is important to also remember the role of the social environment. The results revealed that parents' view about their child's motor skill level ($r = .14$; $p = .027$) and enjoyment of physical activities ($r = .16$; $p = .010$) were associated with child's better movement skills. Therefore, parents' perceptions about their child's motor skills may encourage children to try new skills and become more physically active.

Discussion

Outdoor activities are important for children's motor development (Fjortoft, 2001), wellbeing (Puhakka et al., 2020) and health (Dankiw et al., 2020; Roslund et al. 2020). Earlier findings have also confirmed that the more children play outdoors, the more physically active they are (Truelove et al., 2017; 2019). However, the WHO guidelines for children aged 0–5 suggest that children should be physically active at any intensity level (WHO, 2019). Studies have shown that the outdoor environment offers variations in physical activity intensity levels (Iivonen et al., 2019) and different nature-based stimuli can increase or decrease children's physical activity levels (Gubbels et al., 2018; Iivonen et al., 14.11.2020; Kyttä, 2002).

Finland has been recognised as a versatile Nordic outdoor environment for children's play (Kyttä, 2002), and this might be one reason why Finnish children has found to have better motor competence than children in Central and South of Europe (Laukkanen et al., 2019). The characteristics of Finnish nature and ECE environment (Sääkslahti & Duncombe, 2019) create an interesting location to analyze children's possibilities for outdoor play and the possible consequences for children's motor competence. The analysis of nationally representative Skilled Kids data confirmed that children's living and playing environments both at home and in an ECE were associated with every day possibilities to benefit physical environment affordances.

Typically, there are seasonal variations in physical activity. Rain and winter decrease children's total amount of physical activity because increased time spent indoors (Carson & Spence, 2010). Interestingly, the theory of affordances (Gibson, 1977) explains why and how seasonal characteristics can also be seen as inspiration for children's outdoor play. All kinds of environmental affordances can be realized by playing outdoors every day, every season in all kinds of weather conditions. Clothing is important to enable enjoyable playing experiences in difficult weather conditions (Iivonen & Sääkslahti, 2014; Sääkslahti & Duncombe, 2019). Versatile environments support children's motor development (Fjortoft & Gundersen, 2007), and therefore young children who play more outdoors seem to be more motor competent than children who play mostly inside.

Conclusions

- Nature offers multiple affordances and attracts children to play by challenging their current skill level.
- The total amount of outdoor play and available facilities in the physical environment plays a very important role in children's motor development.
- The more outdoor play, the better motor competence children have.
- Versatile outdoor environments challenge children's motor skills; therefore, such environments can be seen as optimal motor learning environment for young children.

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