This is an electronic reprint of the original article.
This reprint may differ from the original in pagination and typographic detail.

Mishra, Bhavna; Bell, Simon; Mishra, Himansu Sekhar

An exploration of how playground design affects the play behaviour of kindergarten children in Tartu, Estonia

Published in:
Place, Pedagogy and Play

Published: 29/07/2020

Document Version
Peer reviewed version

Please cite the original version:

Mishra, B., Bell, S., & Mishra, H. S. (2020). An exploration of how playground design affects the play behaviour of kindergarten children in Tartu, Estonia. In *Place, Pedagogy and Play: Participation, Design and Research with Children* (pp. 41-62). TAYLOR & FRANCIS.

This material is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the repository collections is not permitted, except that material may be duplicated by you for your research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.

Chapter 3. An exploration of how playground design affects the play behaviour of kindergarten children in Tartu, Estonia.

Bhavna Mishra, Simon Bell and Himansu Sekhar Mishra
Estonian University of Life Sciences

Introduction

In the last few years, there has been an increasing amount of research published on children's outdoor education and the role of outdoor play in early childhood development. The benefits of outdoor and nature play range from improved early childhood development to enhanced problem-solving abilities and better preparation for skilled adult actions.

There has been a lot of research in the field of education and child development which have been used to design or renovate playgrounds in pre-schools. Introducing gaming equipment (Verstraete et al., 2006), paint markings on playgrounds (Stratton, 2000, Stratton and Mullan, 2005), assisted play or supervised play programmes or interventions (Pangrazi et al., 2003) have all proven to have improved child physical activity and mental development. Factors like age, gender and seasonal variability on physical activity in the playground have all proven to have varied results on children's development (Ridgers et al., 2006). It has also been argued that more research is required into the above interventions to find out which of these factors are most influential (Ridgers et al., 2006). There has been more research in urban school playgrounds regarding interventions of natural or green setting that has improved physical activity in children (Dyment and Bell, 2007).

Different aspects of children's play choices, their behaviour, improvements to physical activity through playground markings or equipment and the benefits of natural play are among those to have been studied in different contexts but none of these have been conducted in Estonia. In this chapter we present a study which focused on the behaviour and development in children playing in different types of kindergarten playgrounds in Tartu, the second city of Estonia and the 'educational capital' with several venerable universities and a large academic population.

The pre-school education system in Estonia

We should start by briefly summarising the current situation in Estonia and the reasons for the lack of recent research. Estonia, while recently celebrating 100 years since the

first Declaration of Independence in 1918, went through 47 years under Soviet occupation as part of the Soviet Union starting in 1944 and re-gained independence in 1991. These Soviet years saw the imposition of a centrally-planned and highly regulated system of child care and kindergartens with a very specific approach to care and development of young children which focused less on play than on their development in other ways. All children had to belong to special youth organisations which started with the 'Little Octobrists' at 7 years of age – when children moved from kindergarten to elementary school, so there was already some preparation for political activity – or perhaps we could see this as the last period of innocence.

It took some time for the newly-independent Republic of Estonia to sort out and 'de-Sovietise' all aspects of government and society (in some ways a process still to be finally completed) and it was not until 1999 that the first national framework for a pre-school education curriculum was developed and came into force. Nine years later, by 2008, it was realized by the educational authorities that the pre-school or kindergarten curriculum did not meet the needs of a rapidly evolving society. Estonia was, by then, one of the fastest developing states of the new Europe in economic, political and creative terms, having joined the European Union in 2004. It has adopted a mostly Nordic model of development, looking largely to Finland as a source of inspiration, where among other areas the educational system is the envy of Europe. However, there are still echoes and remains from the Soviet time present in various guises and which still need to be resolved. Early childhood development and the role of kindergartens is one of these aspects.

Thus, in 2008, a new curriculum was established which emphasized the importance of children's comprehensive development (Lasteasutuse riiklik Öppekava, 2008). "Play" was stated to be the main activity of children in the new curriculum. The rationale for this was that through play children develop communicative skills, emotional values, and socializing abilities. According to Tuul et al. (2011), during Soviet rule, play spaces in pre-schools were over-regulated and play was regarded as an isolated activity detached from more important tasks such as learning or practicing self-help skills. The first post-independence curriculum still contained too much of the Soviet model and this was largely because most of the people involved in its development had come through the Soviet system and had little if any experience of other, more contemporary, models. In this 2008 curriculum, still the current one used across the country, the role of play aims to achieve a broad range of educational activities, self-determination, and freedom of play choice.

While the curriculum has changed, many of the kindergarten premises still date from Soviet times and the kindergarten outdoor playground and its design still remains, in

essence, almost the same now as it was before 1991. While play itself is recognised as having a role, what exactly play consists of, what is a playful environment and what is the potential of the outdoors for play are not very well-understood concepts among kindergarten teachers. All kindergartens in Estonia cater to children from the age group of 3-7 years. There are state-run kindergartens with free places as well as private establishments, some of which accommodate the children of foreign academics and students (Tartu being a university city). There is strong competition for places

A typical daily routine in an Estonian kindergarten is as follows:

Children are dropped off by parents at 08.00 and they have breakfast

The study hours together with indoor play activities start at 09.00

From 10.30 -11.30 they are taken outside to play (weather permitting) and once outside have no free choice to go back indoors until the end of the session

At 11.30 they line up to go inside and at 12.00 they have lunch

After lunch from 13.00 - 15.00 they have a nap time

From 15.00 - 16.00 they play/do gym activities indoors or outdoors depending on the planned schedule of each kindergarten (all have different strategies)

At 16.30 to 17.00 they have dinner.

After dinner, they are collected by their parents/guardians.

Another aspect specific to Estonia (as well as other Nordic and Baltic countries and also Russia) is the winter climate which can result in very cold (down to -30° Celsius on occasion) conditions and with considerable amounts of snow. In the very coldest periods small children are not allowed outside for fear of damaging their lungs, while snow and ice may pose risks of slipping and hurting – although all children have very warm clothes suitable for these conditions and dry powdery snow is excellent for playing in!

Contemporary guidance on school ground design

New school grounds designed by landscape architects tend to include natural elements such as trees, butterfly gardens, ponds and vegetable patches related to an understanding of childhood needs, depending on the site constraints. Gardening, naturalization, restoration and greening are terms used in projects for school grounds where natural environments are thought to have positive benefits to children. The greening of playgrounds has become prominent in Australia, Canada, Denmark, the United States, the United Kingdom, New Zealand and South Africa, embracing natural settings in the school playground (Bell and Dymont, 2006). Natural playgrounds have been found to benefit the physical, emotional, mental and social development of children (Kirkby, 1989, Greenwood et al., 1998, Barbour, 1999, Malone and Trante,r

2003). Green school grounds in Canada with trees, gardens and various other natural elements have been found to have positive benefits on the health and physical activity of children (Dyment and Bell 2007).

The concepts such as “playscape” (Frost, 1992) and “affordance” (Gibson, 1979) which describe an awareness of the natural play environments and their functional significance in children’s play also provides strong support to this research. The Playscape concept claims, with supporting evidence, that children playing in natural environments gain more benefits than from any other play environments. Gibson’s affordance theory suggests that a wide range of elements in the playground helps stimulate many play activities. These may not be specifically designed into the space but occur due to the potentials they offer. One example could be a tree with low, strong branches which can afford climbing-on, swinging from or constructing in, another could be a small pebble which can afford grasping or throwing by a small child. Therefore, from the smallest elements in the playgrounds to the overall layout, all aspects of design influence children in their early developmental stages.

Kindergarten playgrounds in societies where pre-school care and preliminary education is an essential part of the overall curriculum, can play a very important role in early childhood health and development. Outdoor play by children in kindergartens has been strongly related to better learning of creative problem solving, cooperative behaviour and logical thinking. Fisher (1992) found that play improved the progress of early childhood cognitive, linguistic, and affective-social development. There is a positive influence of well-designed playground features on the social, emotional and cognitive development of children, which afford high levels of physical activity through different play forms. Spacious preschool outdoor play areas have been found to trigger physical activity and development when there are diverse natural elements (Fjørtoft, 2009; Ozdemir & Yilmaz, 2008). Greener playgrounds or public playgrounds in a more natural setting have shown increased amounts of physical activity (Lucas and Dyment, 2010) and social interaction in children (Seeland et al, 2009).

Therefore, the purpose of the study described in this chapter was to test the degree to which the above evidence can be found in Estonian kindergarten playgrounds by determining the relationship between different types of playgrounds and the variety of activities and associated development in children.

The application of the behaviour mapping method in the research

Researching on small children, especially ones who are not very articulate is extremely difficult and poses a number of ethical issues. In this study we decided to apply a mode of behaviour observation so that we could avoid any direct contact with children and

also make sure our research did not affect their behaviour. In addition, we developed some innovative data recording and analysis methods which may have potential for similar research in the future.

Studying different, contrasting case studies is a research strategy with a clear potential to produce new knowledge through projection of new variables and dynamics (Swaffield, 2011). We used four case studies in this research (see later section). Two were playgrounds which have existed since Soviet times and which had undergone very few changes since then, the third was a newly designed kindergarten playground and the third a city park with a natural setting used as a kindergarten playground in the recess hours.

In Estonian kindergartens the children are divided into groups (or classes) according to the age ranges. As it was impossible to study all the children in each kindergarten a sample group was selected for observation and analysis –a similarly aged group from each, 3½-4½, 4-5 or 4-6 years being the closest possible matches across all four case studies.

The target group of children in each case study kindergarten were observed for half an hour during the morning play hours (10.30 am to 11.00 am) over four days in one week in the month of October, through direct observation, videography and recording field notes wherever necessary. The timing of the observations in October and for the short period was a result of the available time in the semester for undertaking field research. Kindergartens are closed in the summer (start of June to end of August) and in the deep winter outdoor play may be restricted so this time was most practical.

The method combined the System of Observing Play and activity in Youth (SOPLAY) with observation relating activity types to specific locations (behaviour settings) (Cosco, Moore and Islam, 2010) to the playground types and target areas described by Cummins and Zamani (2017) to identify the affordances of the types offered. The recording method we used in this study involved systematic, two-minute scans of all the children in the 30-minute recorded video of the selected study group in the pre-determined target. The two-minute time lapse sampling used is similar to the SOPLAY time-lapse testing by McKenzie et al. (2000). It is a standard instrument for measuring macro-population data and has proven valid in similar studies and was thus deemed appropriate for this study. In the SOPLAY testing, the target areas are scanned individually whereas in this research the pre-categorised different types of playgrounds with different target areas were scanned.

A unique feature of this work was that instead of just recording a static picture at a point in time, a detailed analysis of how each child used the area and moved around within it was obtained and from it a series of time-lapse animations showing how the children moved around the site over the 30-minute period was generated. This complex recording could not have been undertaken by manual methods. Unfortunately, in a book, we cannot show the animations in an illustration.

Following the video recording in the field, the raw recordings were used to capture specific data for each two-minute scan: the number of boys and girls in each target area of the playground were counted and the dominant type of play activity observed for each child in their respective target areas was recorded. The categories of play types were selected according to play theory as being one of the three types: Social play, Motor play and Cognitive play (Bell, 2008) and the levels of play were analysed according to general child development as Functional play, Cooperative play, Role play, Rule game, Symbolic play or being sedentary; each were analysed separately since it is possible to link the play types with child development.

The use of a Geographical Information System (GIS) for behaviour mapping of pre-school children has already been widely practiced (Cosco et al, 2010). Behaviour mapping is an unobtrusive, direct observational method for recording both the location of subjects and measuring their activity levels simultaneously. It is also very practical when the researcher does not wish to affect the behaviour of study subjects and where no direct access is possible due to ethical concerns. By recording the precise location of a participant on a detailed plan of a place, and associating that point with a range of attributes, it is possible to undertake a variety of analyses of that behaviour and the affordances of the location in relation to it. We used the freely available Quantum GIS (QGIS) to record the information.

Table 3.1. Example of the chart showing the recorded activity of each child in every two-minute scan.

Before data entry we prepared charts based on observing each two-minute long recorded activity of each child, to classify activities prior to converting the video data into spatially resolved data in the GIS (Table 3.1). A base plan had also been previously prepared from spatially-referenced site plans and a detailed survey of each play area, so as to be able to locate each child in a precise spot. Then, for each two-minute segment the precise location of each child (target area) was marked as a user-defined coordinate on the QGIS maps and for each point the gender of each child, the type of play, and type of physical activity levels were listed in the database.

At each case study kindergarten, a total number of 64 scans (one scan equalled a two-minute time lapse) of each target area was conducted over 30 minutes' time for four days during a week. Therefore, a total number of 256 scans (1 scan x 16 times x 4 days in one kindergarten x 4 kindergartens) was obtained and each one was interpreted into the QGIS and analysed to determine the type of play conducted in the target areas, which playground types produced most social, motor or cognitive play, gender variation in play activities, physical activity levels in different types of playgrounds etc.

The playgrounds used in the study

As the main intention of the study was to analyse child development while playing in different kindergarten outdoor playgrounds in Tartu it was necessary to find suitable examples as case studies with staff who were interested in and willing to participate and facilitate the research. The selection of the playgrounds depended on their diversity and potential to qualify as comparative case studies. There are some 31 public and 11 private kindergartens in Tartu, 10 of which were very different from each other in terms of the playground features and showed potential for the proposed study. Following an ethical procedure for obtaining permission four of the 10 kindergartens gave their full approval for the research.

As the design or layout of the playgrounds differ in each case study kindergarten, it was necessary to categorise the different playgrounds before research began. Based on Cummins and Zamani's (2017) description of *play target areas*, the kindergarten playgrounds were categorised into one of three types: 1) Natural (Centre D), 2) Mixed (Centres A and B) and 3) Manufactured (Centre C) based on the similar target areas present in these kindergarten playgrounds (Table 3.2 and Figure 3.1). Furthermore, the target areas at each playground suggested many kinds of play-affordances with their potential contribution to development in children.

Table 3.2. Description of Play target areas and playground types, categorised according to the target areas using the description from Cummins and Zamani (2017).

Figure 3.1. The illustrated maps showing the character of each playground at 1) Centre A, 2) Centre B, 3) Centre C and 4) Centre D respectively (Source: the authors).

Figure 2. The photographs showing the character of each of the playgrounds at a) Centre A, b) Centre B, c) Centre C and d) Centre D respectively. (intentionally blurred not to show any identification of the children (Source: the authors)).

Centre A (Figure 3.1-1 and 3.2a) is a typical Soviet-era school and while it has undergone a lot of change with the addition of newer play equipment it still has a very traditional setting. The kindergarten caters to 160 children in total, allocated to 14 separate playgroups. Each playgroup uses an allocated section in the outdoor playground during the morning recess (10.30 a.m. to 11.00 a.m.). The target group played in a 500 m² section of the playground and used the same patch every day. The study group comprised 16 children (9 boys and 7 girls) in the age group of 4-5 years. According to the playground categories selected, the target areas that describe the Centre A playground are: trees, hard-surfaced path, sand, playhouse, green patches, table/chair, swing, play structure and see-saw (Table 3.1) which fits the category of "Mixed Playground" type.

Centre B (Figure 3.1-2 and 3.2b) is also one of the typical Soviet-era kindergartens but has had a recent renovation to its playground. It also has several earth mounds where children play with their sledges in the winter snow, which sets it apart from the others which are rather flat. The kindergarten has a total of 280 children divided into 14 playgroups. The children play in different allocated patches of play areas in the outdoor playground. The study target group plays in a very compact play area of 250 m². The group consisted of 17 children (10 boys and 7 girls) in the age group of 3½-4½ years. According to the playground categories, the target areas that describe the Centre B playground are: trees, hard-surfaced path, sand, playhouse, green patches, table/chair, swing, and play structure (Table 3.1) which fulfils the category of "Mixed Playground" type.

Centre C (Figure 3.1-3 and 3.2c) is a newly built kindergarten with a modern playground design. The kindergarten is smaller than Centres A and B and has 80 children in total organised into 6 playgroups. The children play in different allocated patches of play areas in the outdoor playground. The target group studied had 13 children (6 boys and 7 girls) and in the age group of 4-6 years. According to the playground categories selected, the target areas that describes the Centre C playground are: hard-surfaced path, sand, green patches, table/chair, swing, platform, play structure, rockers, gazebo and see-saw (Table 3.1) and fulfils the category of "Manufactured Playground" type.

Centre D (Figure 3.1-4 and 3.2d) is different in that it uses a public park for its outdoor play area which can be considered as a natural play area, since it has no play equipment such as swings or sandboxes etc. Even though the public park is managed,

and the grass is mown, nevertheless it still has quite a natural setting and feeling. The kindergarten is the smallest, with 35 children in total divided into 4 small playgroups (maximum of 11 children in a group). All the children can use the entire outdoor public park for play during the play time. The curriculum of outdoor play is different to the other three case studies. The boys and girls are looked after separately during outdoor play by different teachers. Unlike other kindergartens, the play groups also have a gym teacher helping them in assisted play in the outdoor play area once in a week. The target group studied had 8 children (6 boys and 2 girls) and in the age group of 4-6 years. According to the playground categories selected, the target areas that describes the Centre A playground are: hills, camp, stick pile, trail, trees, hard surface pathways, sand, play houses, and green patches (Table 3.1) and fulfils the category of "Natural Playground" type.

Favourite Target Areas

We found both similarities and differences in the popularity of the different target areas in each playground.

At Centre A

Centre A, categorised as a mixed playground, has all the play equipment evenly spaced across it. The play area for 16 children in the target group is 500m². The most popular space was the green patches (37.01 % of observed children playing there) and the see-saw was the least popular (2.15%). The remaining seven target areas each contained between 2.93% and 29.39% of the children (see Figure 3.3).

Figure 3.3: The favourite places observed in Centre A (Source: the authors)

At Centre B

Centre B is also a mixed playground with all the play equipment placed in a very small and compact space. The play area for 17 children in the target group is 250m² which is very densely occupied during the play time. The most popular space was the sand box (43.29 % of observed children playing there) and the swing was the least popular (0.83%). The remaining five target areas each contained between 1.65% and 27.39% of the children (see Figure 3.4).

Figure 3.4: The favourite places observed in Centre B (Source: the authors)

At Centre C

Centre C is a manufactured playground and all the play equipment is placed in a sand pit and surrounded by a low, thin bamboo-like edging/platform which children also use

for balancing. The play area for the 13 children in the target group is 280m², which is also very compact. The most popular space was the sand (29.33 % of observed children playing there) and the gazebo was the least popular (0.12%). The remaining eight target areas each contained between 0.84% and 19.35% of the children (Figure 3.5).

Figure 3.5: The favourite places observed at Centre C (Source: the authors)

At Centre D

Centre D is a natural playground and has a natural setting with old trees, manmade green patches, gravel pathways (counted as hard-surfaced pathways), trails, maze bushes (seen in Figure 4) and a gazebo (as seen in most Estonian public manor parks). The play area defined for 8 children in the target group is the entire park size of 3500m² which is relatively large compared with the other case studies. The most popular space was the green patches (49.02 % of observed children playing there) and the stick pile was the least popular (0.98%). The remaining eight target areas each contained between 0.98% and 17.38% of the children (Figure 3.6).

Figure 3.6: Favourite places observed at Centre D (Source: the authors)

Dominant Play types in Different Target Areas in Each Playground

We also found similarities and differences in the dominant play types at each centre – clearly affected by the affordances of the facilities.

At Centre A

Across all the target areas at Centre A, children were mostly engaged in functional (29.97% of all scans) and cooperative play (22.48% of all scans) (Figure 6). Although it is relatively small proportion, it is worth noting that the greatest proportions of constructive play (18.21% of all scans) and role play (17.94% of all scans) was observed at Centre A. The hard-surfaced pathway and swing promoted the highest proportion of functional play (82.05% and 55.10% of scans in each target areas, respectively). In terms of constructive play, the lowest proportion of children was observed in the playhouse (2.13% of scans in this target area) while the highest was observed in the area under the tree. At the see-saw, the scans revealed that children were engaged in the highest proportion of cooperative play (72.73% of scans in this target area) and, in the play house, the highest proportion of role play (87.23% of scans in this target area) (see Figure 3.7).

Figure 3.7: Dominant play types found in Centre A (Source: the authors)

At Centre B

Irrespective of target area, the children were mostly observed engaging in functional play (44.35% of all scans) followed by cooperative play (29.45% of all scans). The play structure promoted the highest percentages of functional play, followed by the play house and the swing (92.31%, 79.31% and 77.78% of scans in each target area, respectively). The table/chair promoted the highest percentage of cooperative play (72.22% of scans in this target area). No symbolic play was observed in any of the target areas. The sand area mostly promoted constructive and cooperative play (see Figure 3.8).

Figure 3.8: Dominant play types found in Centre B (Source: the authors)

At Centre C

Irrespective of the target area, the scans revealed that the majority of children were engaged in functional play (35.04% of all scans), followed by cooperative play (20.55% of all scans). The sand feature had the highest percentage of constructive play (54.10% of scans in this target area). The rockers at Centre C engaged a cooperative play of 97.16% of scans in this target area. Surprisingly, 21.27% of all scans observed sedentary activity, the highest of all the centres (see Figure 3.9).

Figure 3.9: Dominant play types found in Centre C (Source: the authors)

At Centre D

Irrespective of target area, children at Centre D were engaged in functional play (39.32% of all scans) and cooperative play (21.71% of all scans) (Table 3). All target areas, except the areas under the trees, promoted a high degree of functional play (e.g. the gazebo 84.27% of scans, hard-surfaced pathways 76.27% of scans and hills 75% of scans in these target areas). Interestingly, the area under the trees promoted notably less functional play and more role play (see Figure 3.10).

Figure 3.10: Dominant play types found in Centre D (Source: the authors)

The comparative analysis of the mixed playgrounds of Centres A and B shows that the compact and dense playground (Centre B) performed better in terms of the physical activity levels of the children. Children seemed to be influenced by their closer interaction with other children in the denser playground, which may motivate them to be more active compared with the children playing at the more open Centre A mixed playground. More functional and role play activities were identified as taking place in outdoor playgrounds in a study by Shim et al. (2001), and our findings also showed clear evidence of the same at the Centre A mixed playground, Centre C manufactured

playground and Centre D natural playground; but at Centre B the mixed playground, with compact and denser play area, showed less evidence of role play. It might be because of the greater social interaction through cooperative play.

At centre D, the natural playground did not score very highly in terms of levels of physical activity, which goes against the trend observed by e.g. Munoz (2009), that forest schools increase physical activities in children, maybe because although it is in a natural setting, this public park may not fulfil the aspects of a forest school or else the children are attracted to other aspects – we noted a lot more functional and role play there. Boldermann et al. (2006), Fjørtoft (2004) and Fjørtoft and Sageie (2000) also found that natural environments invited more physical activities than the traditional playgrounds whereas we found the mixed playground with a very compact play area (Centre B) had most physical activity of all the cases. In line with Johnson (2004), who found that the opportunity to engage in adventurous play, involving imagination and even an element of risk, to be missing in many contemporary adult-designed play spaces we found the same in the manufactured playground Centre C.

Also, in line with Frost and Campbell (1985) we found that functional play and rule games occurred significantly more on the traditional (or mixed) playgrounds, while role play, and constructive play took place more often on the manufactured playgrounds. Moreover, Goldstein (2012) found that children tend to play longer when they are provided with suitable objects or activities. This was clearly seen in the fourth day of observations at Centre D, when the children were engaged in vigorous assisted play and they wanted to play longer. Dymont et al., (2009) point out that most vigorous physical activity occurs in manufactured playgrounds like Centre C and that most natural playgrounds invite moderate play like we found in Centre D.

When children play with loose parts or sand they tend to carry out more constructive play and are also encouraged to be involved in role play (Maxwell et al, 2008) which we also found in all the different types of playgrounds except the natural playground Centre D which had no sand. Equipment for games (Verstraete et al., 2006), painted markings on playgrounds (Stratton, 2000, Stratton and Mullan, 2005) and assisted play or supervised play (Pangrazi et al., 2003) interventions have been shown to promote improved physical activity and mental development and we found these kinds of interventions to be needed more at the Centre D natural playground and also that they are practised one day a week there by the kindergarten.

Playground Types and Physical Activity Levels

The mixed playground Centre A showed a balanced physical activity level ranging from low to vigorous as calculated from the scans. The mixed playground Centre B showed more moderate physical activity while at Centre C there was much less vigorous physical activity seen from the scans. At the natural playground Centre D, there was a balance between low and vigorous physical activity levels. The greatest social development score was shown by the Centre D natural playground (46% of all scans), followed by the Centre B and C mixed playground (33% of all scans) while the Centre A mixed playground (32% of all scans) was slightly less (Figure 11).

Figure 3.11: Levels of low, moderate and high physical activity across all four centres (Source: the authors)

The maximum degree of motor development was found at Centre B (39% of all scans) followed by Centre A mixed playground (34% of all scans) with the lowest motor development score seen at Centre C (29% of all scans) – although it scored highest for cognitive development (43% of all scans). Surprisingly, the Centre D natural playground showed the least cognitive development (22% of all scans) compared with the other playgrounds. As already shown by Bradley (1985), the different types of factory-made toys placed in the compact manufactured playground such as at Centre C offered the most cognitive contribution to pre-school children. In a study by Driscoll and Carter (2009) the availability of toys increased social interaction in children which is to some degree contradicted by the findings from the natural playground of Centre D, where the absence of toys and equipment led to increased social interaction among children, possibly due to a greater dependency on each other to play. Studies have found that the natural environment contributes to the improvement of problem-solving activities, increased creativity and social interaction (O'Brien, 2005) and gives educational benefits which we also saw in the natural playground Centre D.

There is evidence that play activity behaviour and developmental aspects in a variety of outdoor play areas has a significant role in children's social, emotional and cognitive development (Barbour, 1999; Shim et al., 2001; Fjørtoft, 2001; Dymont et al., 2009). This is reflected in the findings of the mixed playgrounds A, and B which are also more diverse compared to other two playgrounds. Play in naturally designed areas, compared with traditional (mixed) playgrounds seems to have a positive influence on social competencies (O'Brien and Murray, 2007), which was also seen in the results obtained from the natural playground centre D. The maximum motor development noticed at the Centre B is most probably due to the diversity and the influence of close interaction between children who tend to run around or perform vigorous physical activities. Centre A scored 34% of all scans for motor development in part because of the free movement possible in the open grassy patch and along the hard-surfaced path without any

obstructions. Centre C saw less motor development, possibly due to the many obstructions to free movement.

The mixed playgrounds showed a balance between social, motor and cognitive development, whereas the manufactured playground scored higher in the cognitive development and the natural playground scored higher in social development. At centre A, target areas of sand and grassy patches showed a balance of social, motor and cognitive development possibly because they were more open and less dense play areas. At centre B, target areas of hard-surfaced paths and sand provided maximum benefits for social, motor and cognitive development. At centre C, since the entire play area is on sand, it also showed high potential for social, motor and cognitive skills. At Centre D, the grassy patches contributed to a greater degree child development due to the possibilities for free movement together with other opportunities for talking, playing, fighting, constructing etc.

Boys and Girls play differently

Dyment et al., (2009) have demonstrated a clear variation in gender preferences for play choices in outdoor play activities which we also found in all the three types of playgrounds as follows:

At Centre A

Girls showed some favourite play target areas such as the green patch behind the playhouse, the swing and the sand. Although girls and boys played in groups the play activities differed due to different choices (Dyment et al., 2009). The data on physical activity levels showed that girls were either sedentary or involved in role play whereas boys were mostly involved in vigorous functional activity.

Figure 3.12: Play patterns of boys (blue) and girls (pink) at Centre A (Source: the authors)

At Centre B

Here there is a clear picture of the most typical play choices in the dense playground. Girls were either playing with the sand and talking or were sedentary or playing in the play structure with the slides. Girls tended to perform low to moderate physical activity while the boys were moving or running around the whole playground uniformly, as it is a compact playground with lot of opportunities for playing with other groups, all activities being close to each other (Figure 13).

Figure 3.13: Play patterns of boys (blue) and girls (pink) at Centre B (Source: the

authors)

At Centre C

Surprisingly, at this manufactured playground, even though girls and boys play differently, and physical activity levels were different, their play movements showed a very similar spread across the whole playground as compared to the boys (Figure 14).

Figure 3.14: Play patterns of boys (blue) and girls (pink) at Centre C (Source: the authors)

At Centre D

It was clear from the analysis that boys and girls played differently in the natural playground. The boys' activities covered 75% of the playground, moving to cosy places further away but the girls tended to remain secure in the open areas at the centre of the playground. However, on the last day of the study here, we found that boys and girls played in almost the same manner when involved in adult-assisted play with rule games. Groves and McNish (2008) state that landscape intervention in a school playground may lead to increase in girls' levels of physical activity, so at the natural playground centre D, there is an opportunity to add some temporary loose materials which might improve the girl's participation in motor activities (Fig 15).

Figure 3.15: Play patterns of boys (blue) and girls (pink) at Centre A (Source: the authors)

Conclusions

The study revealed that the children were using the three types of playgrounds at Centres A, B, C & D differently while the outdoor play duration of all four kindergartens were the same according to the standard curriculum. Whilst this study has only focused on the design of kindergarten outdoor playgrounds as a determinant of children's play behaviour and development, many other factors are also likely to influence where and how children play. For example, the age preferences for different types of outdoor play, physical competence levels, the climate (which is a major factor in Estonia but is not included in this study), cultural influences and parental upbringing may all exert influence.

The centre staff and their role in the pre-school play space also plays an important role in how children play. Some teachers would see the outdoor play time as being equally important as indoor time and would engage and interact with children, while other teachers might see it as a time to have a break for both themselves and the children

and would assume a primarily supervisory role with no direct interaction with the children during this time. Closely related to this point are teachers' physical and mental abilities, experience, training and the pre-school curricula which can also influence how teachers interpret the role of outdoor play in children's lives (Dowda et al., 2004; O'Connor and Temple, 2005). Growing research on children's play benefits through outdoor play such as studies by Elkind, (2007) and Fisher et al. (2011) have led to the introduction of outdoor play in the pre-school curricula and has been also included in the curriculum of Estonian pre-schools since 2008.

Research has shown that interventions, such as the introduction of loose parts and play equipment (Verstraete et al., 2006), the provision of rule games, assisted play and symbolic play (Lawlis et al. 2008) as well as the use of playground marking (Cardon et al., 2009) can affect where and how children play outdoors. Finally, different climatic or environmental factors influence children's play choices, including very cold conditions, snow play or it being too sunny and hot to play (Boldemann et al., 2006), linked to general seasonality (Fisher et al., 2005), and shade provision (Dyment and Bell, 2007).

This study, however, sought to focus on the variables of design with a view to understand and analyse the relationship between playground design, children's play choices, behaviours and development on four kindergarten playgrounds. Our research clearly suggests that the different playground designs could afford different kinds of play which determined their potential to deliver different developmental benefits. Affordances of the landscape are what it offers to the child while playing, and these, whether few or many, have an impact on the child behaviour and performance. Therefore, through the 256 separate observation scans of children playing in the different types of playground, we were able to demonstrate the range of possible play choices and behaviours. This enabled us to illustrate the various ways in which the playground target areas were used, and types of play performed as a function of the affordances of the target areas.

Through the research findings, we found that the notions of preschool playground design commonly held in Estonia need to be reconsidered, especially aspects such as:

- the proportion of hard-surfaced paths,
- the spacing of the play equipment,
- having low tree canopies to provide shelter and shade for children,
- the importance of natural areas,
- the role of early childhood professionals,
- the benefits of manufactured equipment,
- and the assumed popularity of sand boxes.

Our findings suggest a wide range of potential future research. They highlight the contribution of kindergarten playground design for promoting different types of play to support social, motor and cognitive development. they also underline the limitations of some playground design in terms of, for example, play quality, lack of equipment and ground surface obstructions for free play. The strength of the results indicate that the findings deserve further investigation. Nevertheless, children need opportunities that will encourage all types of play and diversity in kindergarten play landscapes. As stated by Paechter and Clark (2007) 'relatively small changes in playground arrangements and organization can also make a comparatively large effect on the activities open to children'.

References

- Barbour, A.C. (1999) The impact of playground design on the play behaviours of children with differing levels of physical competence. *Early Childhood Research Quarterly* 14.1, 75-98.
- Bell, A. and Dymont, J.E. (2006). *Grounds for action: Promoting physical activity through school ground greening in Canada*. Evergreen.
- Bell, S. (2008). *Design for outdoor recreation*. Taylor & Francis.
- Boldermann, C., Blennow, M., Dal, H., Martensson, F., Raustorp, A., Yuen, K., & Wester, U. (2006). Impact of preschool environment upon children's physical activity and sun exposure. *Preventative Medicine*, 42(4), 310–308.
- Bradley, R. H. (1985). Play materials and intellectual development. *Play interactions: the role of toys and parental involvement in children's development*/edited by Catherine Caldwell Brown and Allen W. Gottfried.
- Cardon, G., Labarque, V., Smits, D., & De Bourdeaudhuij, I. (2009). Promoting physical activity at the pre-school playground: the effects of providing markings and play equipment. *Preventive medicine*, 48(4), 335-340.
- Cosco, N. G., Moore, R. C., & Islam, M. Z. (2010). Behaviour mapping: a method for linking preschool physical activity and outdoor design. *Medicine & Science in Sports & Exercise*, 42(3), 513-519.
- Cummins, E. & Zamani, Z. (2017). Play Environments and Affordances. In Masiulani, K., & Cummins, E. (Eds.). *How to Grow a Playspace: Development and Design*. Routledge. 37-47.
- Dowda, M., Pate, R. R., Trost, S. G., Almeida, M. J. C., & Sirard, J. R. (2004). Influences of preschool policies and practices on children's physical activity. *Journal of community health*, 29(3), 183-196.

Driscoll, C., & Carter, M. (2009). The effects of social and isolate toys on the social interaction of preschool children with disabilities. *Journal of Developmental and Physical Disabilities*, 21(4), 279-300.

Dyment, J. E., Bell, A. C., & Lucas, A. J. (2009). The relationship between school ground design and intensity of physical activity. *Children's Geographies*, 7(3), 261–276..

Dyment, J. E., & Bell, A. C. (2007). Grounds for movement: green school grounds as sites for promoting physical activity. *Health education research*, 23(6), 952-962.

Elkind, D. (2007). *The power of play: How spontaneous imaginative activities lead to happier, healthier children*. Da Capo Press.

Fisher, A., Reilly, J. J., Montgomery, C., Kelly, L. A., Williamson, A., Jackson, D. M., & Grant, S. (2005). Seasonality in physical activity and sedentary behavior in young children. *Pediatric Exercise Science*, 17(1), 31-40.

Fisher, E. P. (1992). *The impact of play on development: A meta-analysis*. Play & Culture.

Fjørtoft, I. (2004). Landscape as playscape: The effects of natural environments on children's play and motor development. *Children, Youth and Environments*, 14(2), 21–44.

Fjørtoft, I. (2009). Children in schoolyards: Tracking movement patterns and physical activity in schoolyards using global positioning system and heart rate monitoring. *Landscape and Urban Planning*, 93(3–4), 210–217.

Fjørtoft, Ingunn (2001), 'The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children', *Early Childhood Education Journal*, 29 (2), 111-17.

Fjørtoft, Ingunn and Sageie, Jostein (2000), 'The natural environment as a playground for children: Landscape description and analyses of a natural playscape', *Landscape and Urban Planning*, 48 (1–2), 83-97.

Frost, J., & Campbell, S. (1985). Equipment choices of primary age children on conventional and creative playgrounds. In J. Frost & S. Sunderlin (Eds.), *When children play: Proceedings of the international conference of play and play environments* (pp. 89–92). Olney, MD: Association for Childhood Education International.

Frost, Joe L. *Play and playscapes*. Albany, NY: Delmar, 1992.

Gison, J. J. (1979). The theory of affordances *The Ecological Approach to Visual Perception* (pp. 127-143).

Goldstein, J. (2012). Play in children's development, health and well-being. Brussels: Toy Industries of Europe.

Greenwood, P. W., Greenwood, P. W., Model, K., Rydell, C. P., & Chiesa, J. (1998). Diverting children from a life of crime: Measuring costs and benefits. Rand Corporation.

Groves, L., & McNish, H. (2008). Baseline study of play at Merrylee Primary School. Glasgow (Forestry Commission Scotland).

Johnson, L., M., (2004) 'American playground and schoolyards – a time for change', paper presented at the Open Space, People Space Conference.

Kirkby, M. (1989). Nature as refuge in children's environments. *Children's Environments Quarterly*.

Lasteasutuse riiklik Öppekava, K. (2008). Estonian National Curriculum.

Lawliss, T., Mikhailovich, K., & Morrison, P. A. (2008). Physical activity in long day care and family day care settings. *Australian Journal of Early Childhood*, 33(2), 27-31.

Lucas, A. J., & Dymont, J. E. (2010). Where do children choose to play on the school ground? The influence of green design. *Education 3–13*, 38(2), 177-189.

Malone, K., & Tranter, P. J. (2003). School grounds as sites for learning: Making the most of environmental opportunities. *Environmental Education Research*, 9(3), 283-303.

Maxwell, L. E., Mitchell, M. R., & Evans, G. W. (2008). Effects of play equipment and loose parts on preschool children's outdoor play behavior: An observational study and design intervention. *Children Youth and Environments*, 18(2), 36-63.

McKenzie, T. L., Marshall, S. J., Sallis, J. F., & Conway, T. L. (2000). Leisure-time physical activity in school environments: an observational study using SOPLAY. *Preventive medicine*, 30(1), 70-77.

O'Brien, L., & Murray, R. (2007). Forest School and its impacts on young children: Case studies in Britain. *Urban Forestry & Urban Greening*, 6(4), 249-265.

O'Brien, L., Murray, R., (2005) 'Forest schools in England and Wales: woodland space to learn and grow', *Environmental Education*, Autumn, pp. 25 – 27

O'Connor, J. P., & Temple, V. A. (2005). Constraints and facilitators for physical activity in family day care. *Australian Journal of Early Childhood*, 30(4), 1-10.

Ozdemir, A., & Yilmaz, O. (2008). Assessment of outdoor environments and physical activity in Ankara's primary schools. *Journal of Environmental Psychology*, 28(3), 287–300.

Paechter, C., & Clark, S. (2007). Who are tomboys and how do we recognise them? In *Women's Studies International Forum*. Pergamon. 30 (4), 342-354.

Pangrazi, R. P., Beighle, A., Vehige, T., & Vack, C. (2003). Impact of Promoting Lifestyle Activity for Youth (PLAY) on children's physical activity. *Journal of School Health*, 73(8), 317-321.

Ridgers, N. D., Stratton, G., Clark, E., Fairclough, S. J., & Richardson, D. J. (2006). Day-to-day and seasonal variability of physical activity during school recess. *Preventive medicine*, 42(5), 372-374.

Seeland, K., Dübendorfer, S., & Hansmann, R. (2009). Making friends in Zurich's urban forests and parks: The role of public green space for social inclusion of youths from different cultures. *Forest Policy and Economics*, 11(1), 10-17.

Shim, S.-Y., Herwig, J. E., & Shelley, M. (2001). Preschoolers' play behaviors with peers in classroom and playground settings. *Journal of Research in Childhood Education*, 15(2), 149–163.

Stratton, G., & Mullan, E. (2005). The effect of multicolor playground markings on children's physical activity level during recess. *Preventive medicine*, 41(5-6), 828-833.

Stratton, G. (2000). Promoting children's physical activity in primary school: an intervention study using playground markings. *Ergonomics*, 43(10), 1538-1546.

Swaffield, S. (2011). Research strategies in landscape architecture: Mapping the terrain. *Journal of Landscape Architecture*, 6(1), pp. 34-45.

Tuul, M., Ugaste, A., & Mikser, R. (2011). Teachers' perceptions of the curricula of the Soviet and post-Soviet eras: A case study of Estonian pre-school teachers. *Journal of Curriculum Studies*, 43(6), 759-781.

Verstraete, S. J., Cardon, G. M., De Clercq, D. L., & De Bourdeaudhuij, I. M. (2006). Increasing children's physical activity levels during recess periods in elementary schools: the effects of providing game equipment. *European journal of public health*, 16(4), 415-419.