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**Physical Education in Early Childhood  
Education and Care  
Researches – Best Practices – Situation**

**Branislav Antala  
Giyasettin Demirhan  
Attilio Carraro  
Cagla Ohtar  
Hakan Oz  
Adriana Kaplánová**

*Editors*

**Bratislava 2019**

## **Physical Education in Early Childhood Education and Care: Researches – Best Practices – Situation**

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## Introduction

You are holding a book that is one of the intellectual outcomes of the ERASMUS + project '590769-EPP-1-2017-1-TR-SPO-SSCP, Development of Preschool Physical Activity, Sports and Game Program for Strengthening of Grassroots Sports in EU. The project acronym is „LUDUS – Just Move and Have Fun“. This project, addressed in 2018 - 2019, is focused on supporting physical activity of preschool children. Six partner institutions are involved: Sport Volunteers Association and Hacettepe University in Turkey, University of Padua in Italy, Asterias Sports Club in Greece, Kindrgarden Mecho Pooh in Bulgaria and Comenius University in Bratislava, Slovakia.

The book is also part of the 4<sup>th</sup> Physical Education World Wide Survey, which is carried out by UNESCO in cooperation with FIEP and its partners. The publication is part of one of its lines, focusing on mapping the basic characteristics of physical education and physical activities of children and youth in the world at individual levels of schools, from pre-school education to universities. In 2017 the book "Physical Education in Primary School: Researches - Best Practices - Situation", edited by D. Collela, B. Antala and S. Epifani, was published by Pensa Multimedia in Italy and has 502 pages. 102 authors from 27 countries and 5 continents participated. In 2018, it was followed by a publication "Physical Education in Secondary School: Researches - Best Practices - Situation", published by the University of Montenegro in cooperation with the Montenegrin Sport Academy. The editors were S.Popovič, B.Antala, D.Bjelica and J.Gardašević. It had 343 pages and was prepared by 84 authors from 24 countries and 5 continents.

The publication "Physical Education in Early Childhood Education and Care: Researches - Best Practices -Situation" is published in Slovakia by the Slovak Scientific Society for Physical Education and Sport. Its editors are B. Antala, G. Demirhan, A. Carraro, C. Oktar, H. Oz and A. Kaplánová. It has 464 pages. The contribution of the international organization AIESEP, whose members of its Special Interest Group for Early Years, is also a significant part of the publication. A series of these 4<sup>th</sup> Physical Education World Wide Survey publications will be completed in 2020 with the publication of "Physical Education in Universities: Researches - Best Practices - Situation"

The book is divided into four parts. In the first part of "LUDUS - Just Move and Have Fun" we bring the results of the scientific part of the project focused on literary reviews in the individual participating countries of the project and the results of comparative research of the opinions of parents, teachers, directors of institutions and trainers in individual countries on selected issues of pre-school children participating in regular exercise activities at nurseries and kinder gardens. In the second part of the publication called "Researches", we bring the latest research findings aimed at exploring the physical activity of children in pre-school facilities. The third part, the "Best Practices" brings examples of good practice from different countries of the world and the last fourth part "Situation" is focused on presenting knowledge related to the characteristics of the state of the issue in various countries of the world.



120 authors from 32 countries and five continents participated in the book, of which 20 were European countries (Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, Germany, Greece, Italy, Ireland, Lithuania, Norway, Poland, Portugal, Serbia, Slovakia, Spain, Turkey, Ukraine, United Kingdom) 2 countries from America (Mexico, USA), 4 countries from Asia (China, Hong Kong, Malaysia, Singapore), 3 countries from Africa (Algeria, RSA, Senegal) and 3 countries from Oceania (Australia, New Zealand, Samoa). Therefore, the publication brings a broad international perspective on the issue of pre-school physical education and physical activities in pre-school facilities.

A thank you goes also to the reviewers who, through their comments and advice, helped the authors improve the quality of their contributions.

Branislav Antala  
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Attilio Carraro  
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Adriana Kaplánová

Editors

# Children's Types of Physical Activity and Sedentary Behaviour in Day Care Environment during Outdoor Play over the Course of Four Seasons in Finland

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## Abstract

Habitual physical activity of a young child can be described as play. Outdoor environments are optimal for play as they allow children to move according to their own curiosity and imagination. The amount and quality of the outdoor play reflects the child's habitual physical activity (PA). There is little research data on the amount and quality of children's PA in a day care environment during free outdoor play.

The purpose of this study was to examine how much time children spend on different types of PA and sedentary behaviour (SB) in day care environment during outdoor play during all four seasons in Finland. Secondly, the purpose was to examine the interindividual variability of outdoor play PA in different seasons. *Methods:* Twelve children were individually videotaped for 60 minutes in a day care center yard during free outdoor play in the autumn, winter, spring and summer. Data analysed using direct observation software that coded the duration of time (s) spent in the PA and SB categories. *Results:* Children's proportion of time spent doing light activities and games was 64%–69% depending on the season. The proportion of moderate-to-vigorous activities and games (MVPA) was lowest (3%) in the autumn and highest in the spring (8%). Continuous walking or running was almost non-existent (0-1%) in every season. The same was true of riding a swing (0-1%), except in the summer, when it increased to 7%. Children's SB (lying down, sitting and standing) was high, ranging from 22%–25% depending on season. The differences between the individual children in the proportion of time spent in MVPA were substantial, ranging from 0%–32% depending on season. The differences in individuals' sedentary time were also considerable, ranging from 1%–44%, except in the summer, when the differences were low (2%–4%). *Conclusion:* Based on the findings, we suggest that educators note the interindividual variability in PA behaviour and encourage each individual child to engage in physically active outdoor play in all four seasons.

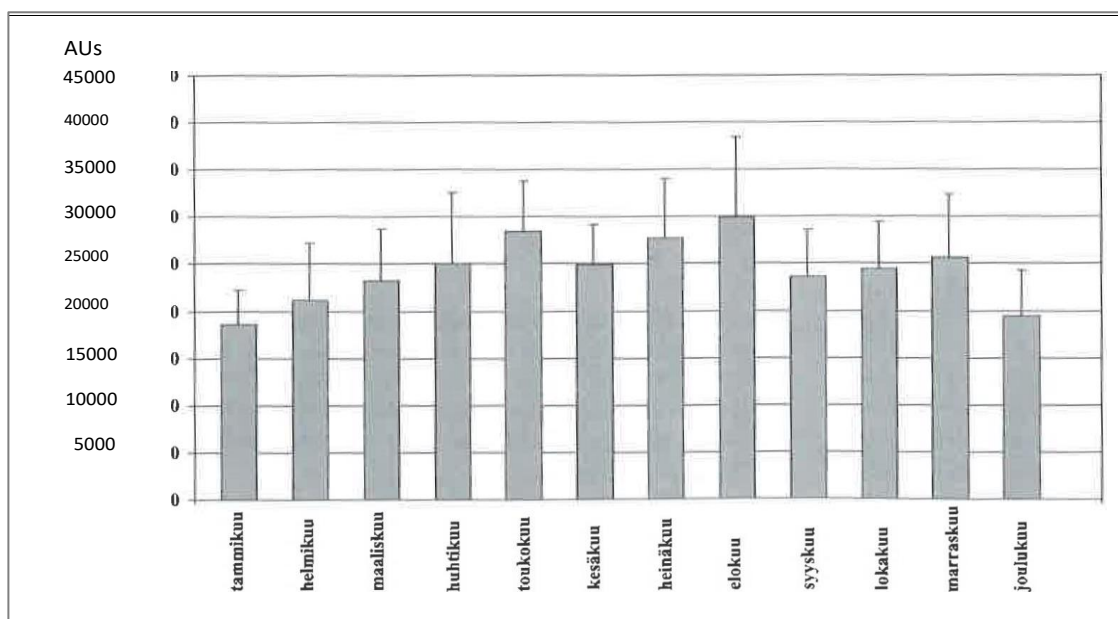
**Key words:** Day care centre, Children, Free play, Physical activity, Outdoor environment

## Introduction

Playing and physical activity (PA) are vital for child development as they enable physical-motor, cognitive, social-emotional, psychological development, as well as well-being (Malina, Bouchard & Bar-Or 2004; Pellegrini & Smith 1998). The UN Convention on the Rights of the Child state that every child has a right to play (The United Nations 1989). PA in young children can be described more appropriately as “play”, or physically active play (Pellegrini & Smith 1998; Timmons, Naylor & Pfeiffer 2007). Burdette and Whitaker (2005, 46) defined play as “the spontaneous activity in which children engage and occupy themselves”. Typically, a young child’s natural, free physically active play can be characterised as intermittent, with short, (3- to 6 seconds in length) bursts of different intensity activity followed by periods of rest (Bailey et al. 1995). Particularly unstructured outdoor free play is important: outdoor environments enable more movement as it includes less restriction on children’s gross motor activity and range of perceptual-motor exploration. It is so an optimal environment for curiosity, use of imagination, and activities where children can unconsciously practice their gross motor skills. (Burdette & Whitaker 2005; Fjortoft 2001.). Active outdoor play is important to a child’s overall development (Hallal et al. 2012).

Many children worldwide are not meeting PA guidelines (Aubert et al. 2018) and have decreased opportunities for active outdoor play (Hallal et al. 2012). In Finland, approximately half (54-59%) of day care-aged (3-6 year- old) children meet the WHO PA guidelines (WHO guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age 2019) recommending that children engage in at least one hour of moderate-to-vigorous physical activity (MVPA) a day (Finland’s Report Card on Physical Activity for Children and Youth 2018). Several individual and environmental factors are associated with young children’s PA (Sallis, Prochaska & Taylor 2000). One study among five-day care centers’ children, who wore accelerometers and GPS devices, indicated that activity counts were more than twice as high outdoors compared to indoors and children were significantly less sedentary and engage in more light and moderate-to-vigorous activity when outdoors compared to indoors (Tandon, Saelens, Zhou & Christakis 2018). Another study using observational methodology in 62-day care centres in Finland indicated that physically active play outdoors was observed very rarely (only 3.1% of the total observation time; Reunamo, Saros & Ruismäki 2012). Further, seasonal variation may exist in PA among young children (0-6 years), even though findings are unclear due to a limited number of studies. As the seasons become more extreme in temperature, especially colder, children seem less likely to be physically active (Carson, Spence, Cutumisu, Boule & Edwards 2010). Jämsen et al. (2011), using a direct observation methodology among Finnish day care children, found that children’s PA was primarily sedentary (60%) and the occurrence of MVPA was low (10 %). However, seasons affected PA so that children accumulated significantly more MVPA during autumn than winter (Jämsen et al. 2015). Another study using actometers (Eaton, McKeen, Saudino 1996, 86-91) to measure PA among 10 six-year-old Finnish children during one year in different months indicated that children’s PA increased towards summer, which was the physically most active season for children during the year. The following figure (Figure 1), published in their research article, illustrates children’s monthly PA variation (Sääkslahti, Numminen, Raittila, Paakkunainen & Välimäki 2000).

They also found that there were large interindividual differences in PA estimates (Sääkslahti et al. 2000).



Note - AUs: activity units; tammikuu: January; helmikuu: February; maaliskuu: March; huhtikuu: April; toukokuu: May; kesäkuu: June; heinäkuu: July; elokuu: August; syyskuu: September; lokakuu: October; marraskuu: November; joulukuu: December

**Figure 1 Activity of children (6-yrs.) measured in different months (Sääkslahti, Numminen, Raittila, Paakkunainen & Välimäki 2000, 21)**

In light of research findings, there is no clarity of whether children's outdoor play in the day care environment consists of different types of physical activity and sedentary behaviour over the course of four different seasons of the year. In addition, there is no clarity of what the differences between individuals in PA and sedentary behaviour (SB) in different seasons are and how much an individual child's PA and SB may change between different seasons. Therefore, the purpose of this study was to examine the amount of time children spend in five types of PA and three types of SB in day care environment during outdoor play over the course of four different seasons. In addition, we aimed to find out the interindividual variability in the PA and SB.

## Methods

### *Video recording*

The data for this study was collected in the yard of one day care centre in central Finland. The yard was a typical day care centre yard in Finland, about 15 x 25 metres in size, with a sandbox, a slide, swings, a seesaw, a playhouse and various play equipment. The ground was flat, lawn or sand and there were a few trees in the yard. There were altogether about 20 children in the day care centre. Before starting the study, the researcher inquired with the day care centre's staff about their willingness to participate in the research. After the day care centres' and staffs' agreement

to participate, all the children's guardians were asked to sign a written informed consent form for their child(ren)'s possible participation in the study. Altogether, 12 children had their guardians' consent (four boys and eight girls aged 4–6 years). Before performing any procedures, the first author (S.I.) got to know the children and told them about the forthcoming data collection in the day care centre yard.

To assess children's PA and SB, direct (systematic) observation was used. Data for observation was collected by filming (Sony HXR-MC50 video-camera) one child at a time, if possible, 60 minutes without interruption in the day care centre yard in the mornings. Data collection began at nine a.m., when the children had free outdoor play according to the daily programme of the centre. Each child was filmed in the autumn, winter, spring and summer (four times over the course of the year). One child (Child Lil) stopped attending the day care centre before the summer and therefore video recordings were drawn from 11 children from the summer. In order to maintain a sense of security and familiarity, the first author carried out all the video recordings. The filming dates for different seasons were spread over a period of about a month, due to varied possibilities of the daycare centre, the children and the researcher, during various mornings. While filming, the distance between first author and the filmed child was 5 to 20 metres. If the child went inside the day care centre building, filming was stopped and continued once the child had come back to the yard. There were few occasions when the child being filmed had to leave the day care centre. Secondly, the day care centre's programme could also suddenly change and therefore all children went inside. On these occasions, the duration of the video material was less than 60 minutes. Table 1 shows the data collection dates, range of temperatures (°C), weather conditions according to a meteorological website (Foreca 2015-2016), and total hours, minutes and seconds of filmed data that was observed per season and per child.

**Table 1 The data collection dates, temperatures, weather conditions and amounts of observed data**

	Autumn	Winter	Spring	Summer
Data collection dates	28.9.-2.11.2015	18.2.-17.3.2016	8.4.-2.5.2016	13.-31.5.2016
Range of temperatures	3°C–11°C	–5°C–3°C	0°C–3°C	9°C–20°C
Weather conditions	cloudy (10 days), clear (2 days)	cloudy (6 days), snowing (6 days)	cloudy (5 days), raining (5 days), clear and dry (2 days)	clear and dry (7 days), cloudy (4 days)
Total observed data per season	11 hours, 51 minutes 59 seconds	12 hours, 3 minutes, 27 seconds	11 hours, 41 minutes, 35 seconds	10 hours, 8 minutes, 52 seconds
Mean observed data per child	59 minutes 20 seconds	60 minutes, 17 seconds	58 minutes, 28 seconds	55 minutes, 21 seconds

### ***Analyzing video material***

The first author analysed each child's video materials using the General Observation Software (Department of Sport Sciences, 2006) which was developed in the study by Iivonen (2009) to assess how much time the day care children spent practicing different fundamental motor skills during lessons of a physical education programme. The General Observation Software (Department of sport sciences, 2006) is a direct observation method (computer software) using continuous duration (length) observational recording technique to measure behaviours. Because it involves observing a subject continuously for the specific amount of time of each behaviour, it is a very informative PA assessment method (McKenzie 2002; Trost 2006) and especially valuable with young children, whose minute-to-minute variability is extremely high (Bailey et al. 1995). During an observation session, behaviours (e.g., sitting) were scored by clicking items on the screen with a mouse at the start of the behaviour and ended automatically when an item representing another behaviour (e.g., walking) was clicked. The observational data (specific time in seconds) entered directly into a PC file (Excel workbook) during the events were coded from the video. Behaviours of children were arranged in eight mutually exclusive categories. To improve validity, five different PA type observation categories consisting of fundamental stability, locomotor and manipulative movements typical for day care aged children (Gallahue & Donnelly, 2003) and three different SB categories were constructed (Table 1). For developing and maintaining observer accuracy, the observer training followed the steps recommended by McKenzie (2002). In this observational study, reliability referred to the level of agreement among two trained, independent, observers (first and second author) and was expressed as a percentage of agreement between the observers coding the same six randomly selected children during the same 10-minute occasions using the video material of this study. Reliability computed as follows:

$$\frac{\text{coded seconds (e.g., 750) of one observer}}{\text{coded seconds (e.g., 790) of a second observer's records}} \times 100 = (\text{e.g., 95}) \% \text{ reliability}$$

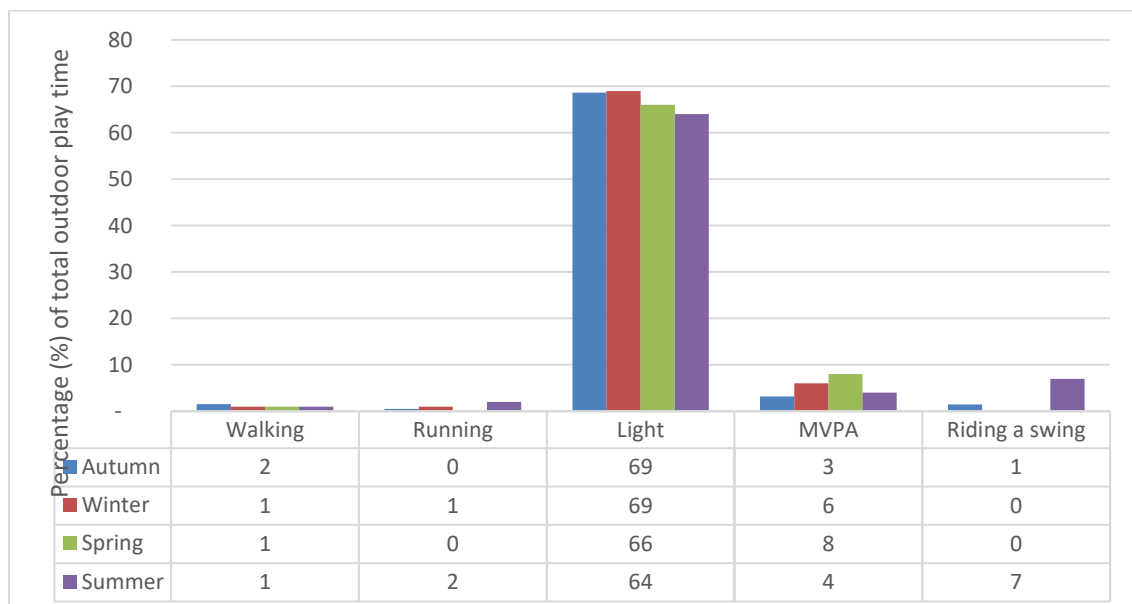
A reliability rate of 80 percent, which is considered necessary for research purposes (Siedentop 1991, 309-311), was obtained in this study in all observation categories (Table 2). All procedures performed in the study were accepted by the Ethics Committee of the University of Jyväskylä.

### **Reviewing results**

Because the durations of the observation data which were obtained from individual children in different seasons of the year varied between children, the results are expressed as percentages. The mean percentages of time spent in five types of PA and three types of SB in the day care environment during outdoor play in all four seasons are shown in figures one and two. Children spent 64%–69% of their time doing light activities and games (Light) during different seasons. The amount of moderate-to-vigorous activities and games (MVPA) was low in every season, being the lowest in the autumn (3%) and the highest in the spring (8%). On the contrary, time spent sedentary (lying down, sitting and standing) was high in every season, being 22% in the summer and 25% in the other seasons. Time spent walking or running was very low (0-1%) in every season. The same was true of riding swings (0-1%), except in the summer, when it increased to seven percent. A detailed examination of the data revealed that two children rode a swing for over 10

**Table 2 Physical activity type and sedentary behavior observation categories, behaviors coded into these categories and interobserver-reliability across the categories**

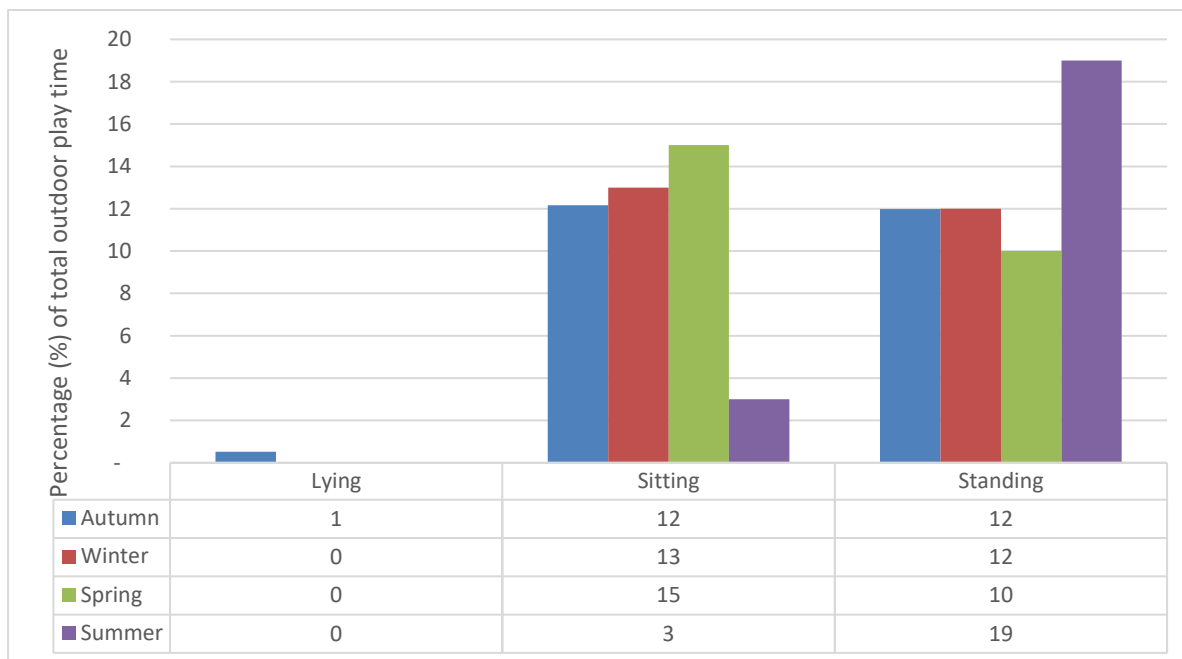
Physical activity type observation categories	Movement behavior coded in this category	Inter-observer reliability as percentage of agreement
Walking	Walking continuously for three seconds or more	87%
Running	Running continuously for three seconds or more	94%
Light activities and games	Doing light activity intensity - <i>non-locomotor movements</i> (axial movements such as bending, stretching, twisting, turning, reaching, lifting and falling), - <i>upright or inverted supports or balancing</i> (individual stunts, partner stunts, balancing on a narrow base of support, headstand, handstand, body rolling, somersault) - <i>manipulative movements</i> (throwing, catching, ball bouncing, rolling, kicking and trapping/collecting) - <i>touching, riding or pushing</i> wheel toys that are not fixed equipment (trucks, scooters, rickshaws, tricycles and wagons)	97%
Moderate-to-vigorous activities and games	Engaging in moderate-to-vigorous activity intensity - <i>locomotor movements</i> (leaping, sliding, galloping, jumping, hopping and skipping), - <i>manipulative movements</i> (throwing, catching, ball bouncing, rolling, kicking and trapping/collecting), - <i>touching riding or pushing</i> wheel toys that are not fixed equipment (trucks, scooters, rickshaws, tricycles and wagons)	99%
Swing riding	Riding a swing continuously for three seconds or more	100%
<b>Sedentary behavior observation categories</b>		
Lying down	Lying down with no movement	100%
Sitting	Sitting still with little to no limb movement	91%
Standing	Standing still with little to no limb movement	96%



Note - MVPA: Moderate-to-vigorous-activities and games; Light: Light activities and games

**Figure 2 The mean percentages of time spent in five different types of physical activity in a day care environment during outdoor play during four seasons**





Note - Lying: Lying down

**Figure 3 The mean percentages of time spent in three types of sedentary behavior in a day care environment during outdoor play during four seasons**

minutes in the summer (Child Au appr. 14min. and Child Ed appr. 12min.), which explains the high mean time spent in this activity type in the summer.

Our results are in line with the findings of the earlier study (Bailey et al. 1995), indicating that children’s free, instructed play behavior consists mainly of activities of low intensity. However, one should take into account that in our study, many different movements were coded into the category of light activities and games, some of which only one limb of the child performed gross-motor movement (e.g., swinging a shovel) and some of which several limbs performed simultaneously gross-motor movement (e.g., pulling a cart). Therefore, the result does not give a very specific picture of children’s activity of light intensity. As in previous studies (Bailey et al. 1995; Reunamo et al. 2012), this study also showed that the occurrence of activities of moderate-to-vigorous intensity was generally low. However, our study, which took into account all four seasons, showed that the proportion of MVPA is not necessarily the lowest in winter, as in the previous study (Jämsen et al. 2015). There was quite a lot of snow in the day care centre yard during the data collection. These snow pits may have functioned as potential affordances in the environment (Kyttä 2004) for some children to motivate them to move and to tempt them into rough-and-tumble play (Pellgrini & Smith 1998), such as the king of the hill–play illustrated in Figure 4 (Figure 4). Therefore, we suggest that to enable children to have experiences based around natural affordances such as snow, if possible, adults could leave the room for active play in snow or in other natural affordances to enable versatile and motivating play.

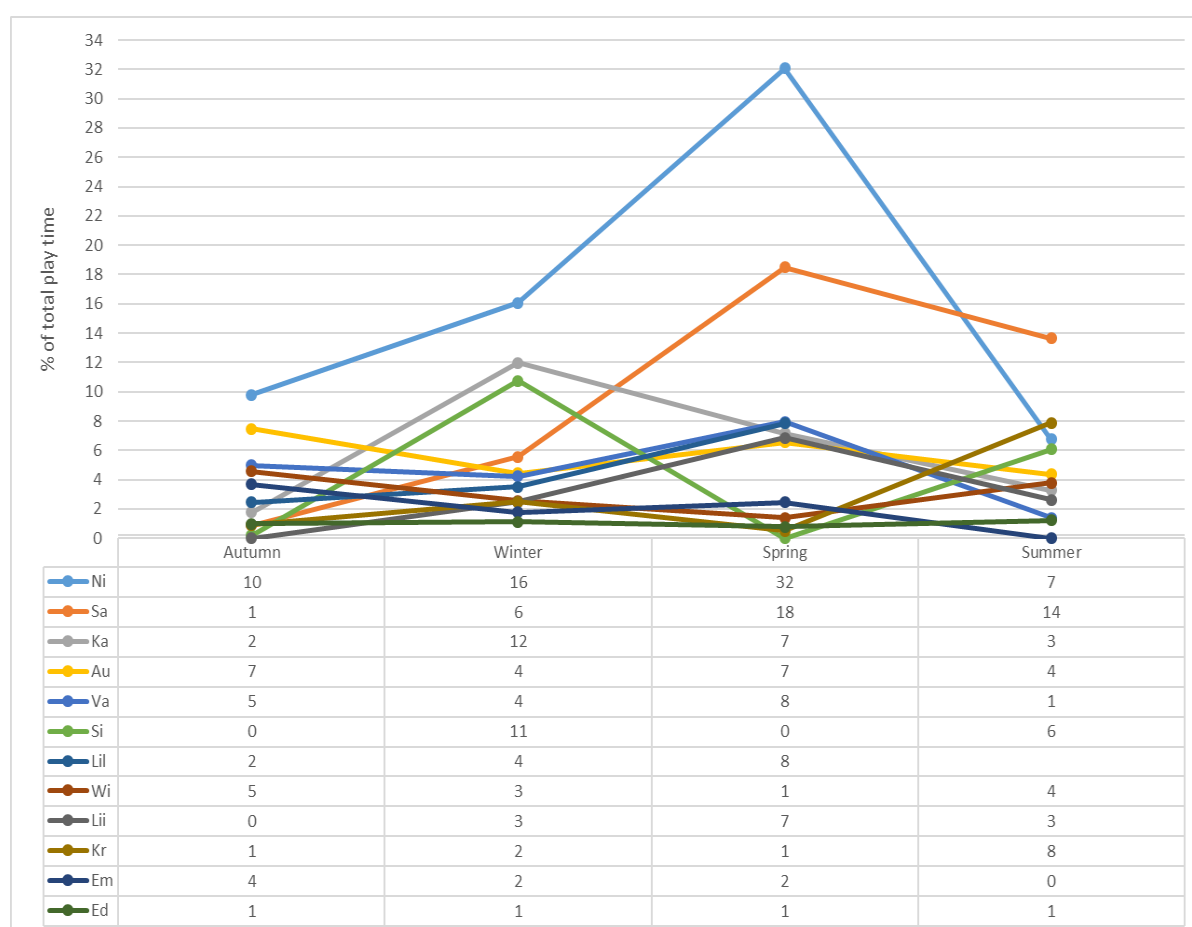




**Figure 4 The King of the Hill game**

The results of this study are in line with previous studies which show that the proportion of children's time spent sedentarily is relatively high (Finland's Report Card on Physical Activity for Children and Youth 2018). This meant, within our study, that of the approximately 60 minutes of free play, approximately 13–15 minutes consisted of sitting or standing. To alter this trend, educators should encourage children participate more to physically active play, since educators' prompting seems to increase children's MVPA (Jämsen et al. 2015). Our results also indicated that the mean time spent on riding a swing increased and the mean time spent on sitting decreased in the summer. As previously noted, some children ride swings for rather long periods of time in the summer. It may have been that these children chose to ride a swing instead of sit. One factor which supports this assumption is the dry weather that prevailed in the data collection days in the summer: In dry weather, a swing might tempt children more than it would have tempted them if the weather was as damp as it was during the data collection days in the spring and in the autumn, making the swing wet and not so comfortable to sit on. The swings were available for children in every season except the winter, when it was not possible to use the swings. From the point of view of the child's physical-motor activity, it is better for the child to ride a swing instead of sit (Gao et al. 2018). Therefore, it is advisable to encourage children to ride a swing during every season. Finally, children's time spent walking or running continuously was almost nonexistent. This was expected, given that, according to Bailey et al. (1995), young children's natural, free PA is intermittent, with short bursts of different activities. Therefore, we assume that typically, children do not perform one specific motor skill for a long period of time.

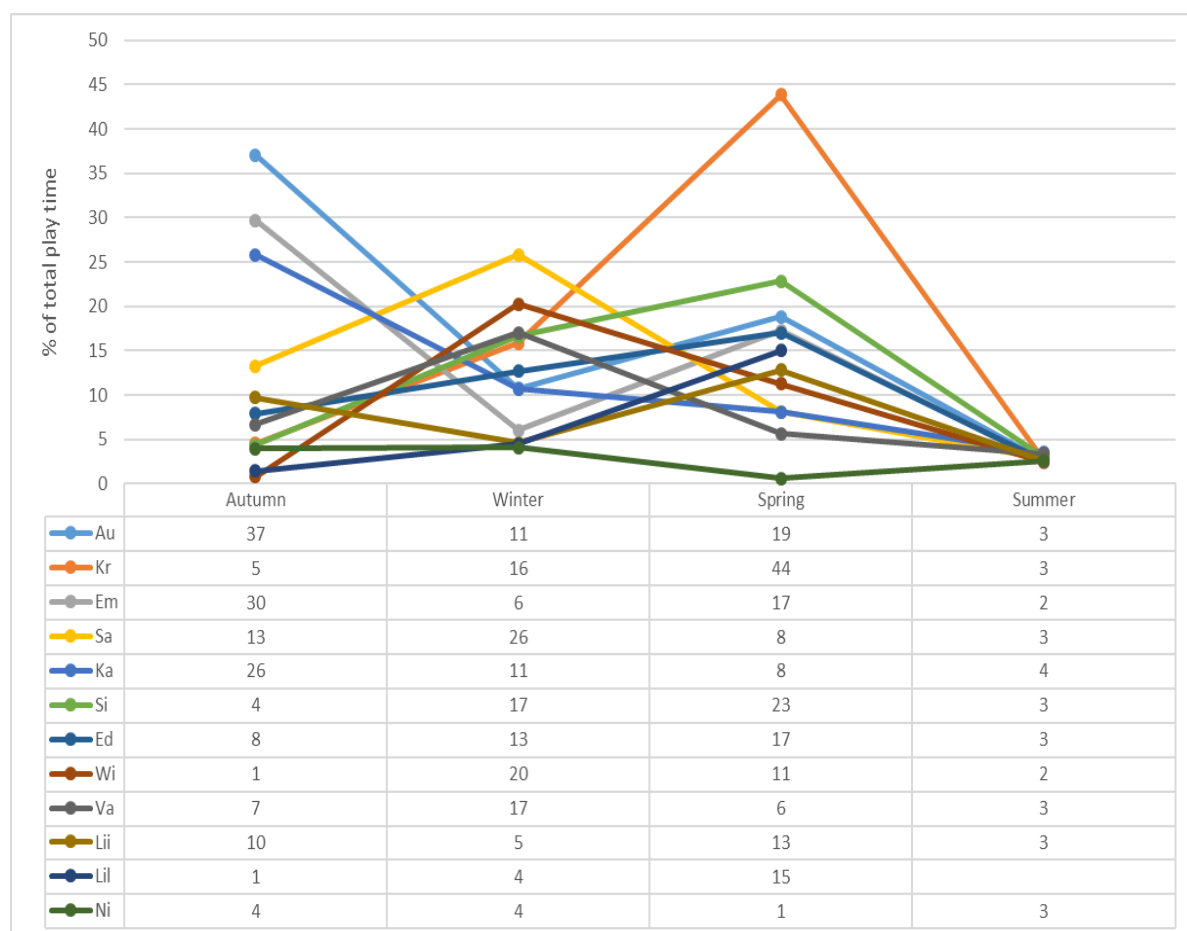
To look at the individual differences in PA, the percentages of time each of the 12 children spent doing moderate-to-vigorous activities within his or her total observed playtime during outdoor play over the course of four seasons were examined and shown in figure five. The differences between the individual children in MVPA and games over the course of four seasons ranged from 0 to 32 percent. The differences were largest in the spring (Child Ni 32% - Child Lil 0%) and smallest in the autumn (Child Ni 10% - Child Si and Child Li, both 0%). Compared to the other children, there was one child (Child Ni) who spent the most on moderate-to-vigorous activities and games during every season, and one child (Child Ed) who accumulated this activity type only one percent during every season. In general, the differences between individual children in moderate-vigorous activities and games were notable in every season.



Note - Below the line chart, where the percentages are arranged so that the child (Ni) that accumulated the most moderate-to-vigorous activities and games over the course of four seasons altogether is the highest and the child who accumulated the least is the lowest (Ed). The percentage of child Lil is missing in the summer because she no longer attended day care in the summer.

**Figure 5 The percentages of time spent doing moderate-to-vigorous physical activities and games by each child during his or her total observed play time in a day care environment during outdoor play over the course four seasons**

To look at the individual differences in SB, the percentages of time spent sitting by each of the 12 children on his or her total observed play time during outdoor play over the course of four seasons were examined and shown in Figure 6. The differences between individual children in the amount of time spent sitting in the autumn, winter and spring were considerable (range 1–44%). In the autumn, one child spent 37% (Child Au) of his total play time sitting while two other children (Child Lil and Child Wi) each accumulated only 1 percent of their total play time doing so. The differences between individual children ranged from 4 to 26 percent in the winter and from 1 to 44 percent in the spring. In the summer, the differences between individuals' sedentary time was low, ranging from 2 to 4 percent.



*Note - Below the line chart, the percentages are arranged so that the child (Au) who accumulated the most sitting over the course of four seasons is altogether the highest and the child who accumulated the least is the lowest (Ni). The percentage the child Lil is missing in the summer because she no longer attended day care in the summer.*

**Figure 6** The percentages of time spent sitting by each child during his or her total observed play time in a day care environment during outdoor play over the course of four seasons.

These results suggest that in some individuals, outdoor play in a day care environment almost did not include any moderate-to-vigorous activities and games at all in any season. In the most active child, 60 minutes of free play included about 19 minutes of moderate-to-vigorous activities and games during the season when the proportion of this activity type was the highest. Compared to other children, the most active child seemed to sit the least in different seasons in total. During the summer, the differences between individuals in sedentary time seemed to decrease. This finding could be explained by the fact that in some children, sitting was replaced with standing and in others, with riding a swing.

The season considerably altered individuals' PA and SB of outdoor play. In the individual child, the change that occurred in the proportion of time spent on moderate-to-vigorous activities and games between the season when the proportion was the highest and the season when the proportion was the lowest was 25%, 17%, 11%, 10%, 7%, 6%, 4% or 3% (Figure 5). In addition, the season influenced the individual's proportion of sedentary time, thus, the change that occurred in the proportion of sedentary time between the season when the proportion was the highest and the season when the proportion was the lowest was 41%, 33%, 28%, 23%, 22%, 20%, 19%, 14%, 10% or 3% (Figure 6).

### **Critical aspects**

The strength of this study was that it considered all four seasons. Another strength was the direct observation method based on continuous duration recording technique that was used. It gave accurate information on how much time (s) an individual child spends on different types of PA and SB in day care environment during free outdoor play. A number of individual attributes and factors related to the day care environment (Sallis et al. 2000), which were not taken into account in this study, supposedly explained the findings of this study. The second weakness of this study was the small sample size.

### **Conclusion**

The day care environment may be an ideal setting to consider a natural place to increase the daily physically active play of children (Burdette & Whitaker 2004). Based on this study, we recommend that factors which prevent children from physically active outdoor play should be removed. Educators should take better account of nature's affordances in different seasons and let them appeal to the child in a manner inspired by their imagination. We also suggest that educators note the interindividual variability in activity behaviour and encourage each individual child to engage in physically active play during all four seasons.

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