Children’s physical activity in day care and preschool

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Children’s physical activity in day care and preschool

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The purpose of the study was to investigate the dynamics of physical activity (PA) in day care and preschool. The participants were 823 Finnish 1–7-year-old children from 50 day care centres and preschools. The research methods were systematic observation, evaluation of children’s skills and interviews with children. Altogether 18,366 observations were collected. Vygotsky’s concept of the ‘zone of proximal development’ is redefined in relation to PA. The results of the study show that environmental factors, and specifically peers, do indeed play a significant role in enhancing PA among children. There are cogent reasons for paying more attention to the dynamics of children’s PA. Furthermore, there is reason to ponder extensively how to provide opportunities for PA and, more precisely, the development of motor competence in the day care and preschool context.

Keywords: early childhood; high physical activity; Vygotsky; peer relations; physical education; learning environment

Introduction

Physical activity (PA) is commonly defined as ‘any body movements produced by the skeletal muscles and that results in a substantial increase over the resting energy expenditure’ (Malina, Bouchard, and Bar-Or 2004, 6). From the muscular perspective, these movements can be classified as gross motor skills (running, jumping, throwing etc.) or fine motor skills (writing, knitting etc.). In contrast, when defined by their functional aspects, it is a question of fundamental motor skills (FMS). FMS are movements intended to gain or maintain balance, transport the body from one point to another and impart force to or receive force from an object (Gallahue, Ozmun, and Goodway 2012, 16–17). In order to achieve basic motor competence, a highly important factor for choices concerning a physically active lifestyle, a child needs to have plenty of opportunities for diverse physical activities and fundamental skill learning. Children with motor learning difficulties tend to be less physically active than their coordinated peers (Hands and Larkin 2002). In this study, children’s PA is categorized into three levels: low, intermediate or high. Additionally, PA is seen as culturally mediated. The general model employed in the study is influenced by Vygotsky (cf. Reunamo 2009). This model is presented in Figure 1.

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The zone of proximal development (ZPD) is a concept formulated by Vygotsky (1978). In ZPD, development is understood as the distance between a child’s personal skills and the activities possible with more competent guidance. According to Vygotsky, developmental factors are interpsychological, and skills are seen as something that can be learned with the assistance of others. In early childhood education and care (ECEC), learning environments are versatile. They consist both of material elements, such as facilities, the immediate environment and equipment, and immaterial elements, such as social and psychological settings (Ministry of Social Affairs and Health 2005). Studies have indicated that the ECEC environment has a significant impact on children’s PA (Bower et al. 2008; Hodges et al. 2012). In particular, this is the case with directed PA, outdoor play and time allotted for both. Less fixed playground equipment and a large playground seem to increase the amount of high PA in children (Bower et al. 2008; Dowda et al. 2009). Outdoors is where free play and gross motor activity are most likely to occur (Burdette, Whitaker, and Daniels 2004). However, there are also findings that emphasize the importance of social factors on children’s PA, especially interrelationship between children (Jago et al. 2011; Wilkin 2011). This suggests that there is a need to widen the concept of ZPD. Consequently, a more accurate concept is suggested for the purpose: the zone of proximal PA. By this, we refer to the distance between the children’s own PA and the PA that is possible to create with peers.

Figure 1. The feedback loop of culturally mediated PA.

**Zone of proximal PA**

The zone of proximal development (ZPD) is a concept formulated by Vygotsky (1978). In ZPD, development is understood as the distance between a child’s personal skills and the activities possible with more competent guidance. According to Vygotsky, developmental factors are interpsychological, and skills are seen as something that can be learned with the assistance of others. In early childhood education and care (ECEC), learning environments are versatile. They consist both of material elements, such as facilities, the immediate environment and equipment, and immaterial elements, such as social and psychological settings (Ministry of Social Affairs and Health 2005). Studies have indicated that the ECEC environment has a significant impact on children’s PA (Bower et al. 2008; Hodges et al. 2012). In particular, this is the case with directed PA, outdoor play and time allotted for both. Less fixed playground equipment and a large playground seem to increase the amount of high PA in children (Bower et al. 2008; Dowda et al. 2009). Outdoors is where free play and gross motor activity are most likely to occur (Burdette, Whitaker, and Daniels 2004). However, there are also findings that emphasize the importance of social factors on children’s PA, especially interrelationship between children (Jago et al. 2011; Wilkin 2011). This suggests that there is a need to widen the concept of ZPD. Consequently, a more accurate concept is suggested for the purpose: the zone of proximal PA. By this, we refer to the distance between the children’s own PA and the PA that is possible to create with peers.

Figure 1. The feedback loop of culturally mediated PA.
Personal PA and skills

Quoting Finnish national recommendations, a child needs at least two hours of brisk PA every day (Ministry of Social Affairs and Health 2005). The urge to give guidelines suggests that the benefits of PA are obvious. This is especially the case from the vantage point of health and motor development (see Malina, Bouchard, and Bar-Or 2004). The urge for recommendations also suggests that there are trends in contemporary society that constrain children’s PA. Sociocultural trends like increasing concerns over safety, the increasing divide between the fit and unfit or lean and overweight, which are partly the result of the socioeconomic status of the family and, more generally, the spread of sedentary lifestyles (see Dollman, Norton, and Norton 2005; Wedderkopp et al. 2004; Lehto et al. 2009) form the rationale for manifold actions to enhance PA in western countries, even among very young children.

A physically active lifestyle in early childhood forms the basis for a healthy and physically active lifestyle in adulthood (Yang et al. 1999; Reilly et al. 2004; Sääkslahti 2005). It also forms the basis for the development of perceptual and fundamental skills (Sääkslahti 2005; Gallahue, Ozmun, and Goodway 2012). The development of FMS is highly important during the early years of a child’s life because, particularly from middle childhood onward, a child with limited motor competence or proficiency chooses sedentary activities over PA (Wrotniak et al. 2006; Gallahue, Ozmun, and Goodway 2012). Access to PA is the route for learning gross motor skills and FMS, and personal PA is the route to motor competence. Similarly, motor competence seems to be a trigger for increased levels of personal PA.

Physical orientation

Children’s physical orientation refers to their personal choices and the production of physical activities. According to Vygotsky (2004), children combine the skills acquired and use them to construct a new reality, one that conforms to their own needs and desires. Children’s personal choices matter. Children learn through play, and they display and build their inner selves: who they are, what they know and how they feel (Butcher and Eaton 1989). According to Reunamo, Saros, and Ruismäki (2012), children’s PA is low during activities arranged by teachers. Furthermore, in day care, children have a large degree of freedom to decide on and invent their own physical activities.

Children’s orientation changes as they develop. Gubbels et al. (2011) found that social factors were associated with PA intensity in 2–3-year-old children. Peer group size was negatively associated with the level of activity during indoor activity. In line with this study, social environmental factors such as smaller group size among 2–3-year-old children (Cardon, Van Cauwenberghe and De Bourdeaudhuij 2011) and 3–5-year-old children (Brown et al. 2009) were shown to be associated with PA intensity. A major transition takes place from the ability to engage in one-to-one relationships to the ability to relate to peers in groups (Hay, Payne, and Chadwick 2004; for age groups cf. Gallahue, Ozmun, and Goodway 2012). Children’s lack of ability to follow the rules of organized physical play, or personality traits like shyness and anxiety, have been found to reduce PA (Dwyer et al. 2008).
Shared creation of PA

According to Vygotsky (2004), children use their skills as tools for creating new forms of culture. Children’s personal PA orientation becomes a shared and creative process. It was found in a study of preschool policies and practices that children spent significantly less time in sedentary activities when the interaction was better between the children and teachers and among the children (Dowda et al. 2004). Livesey et al. (2010) studied 9–12-year-old students and Vannatta et al. (2009) studied students from second grade elementary to high school. They found that children with poor motor performance had lower levels of PA and were less liked by their peers. It may be that these tendencies have their roots in early childhood. Brown et al. (2009) found that high PA was most likely in situations where children were without adults; child-initiated activities resulted in higher PA than adult-initiated activities. Cardon et al. (2008) noticed that PA decreased when there were more teachers supervising. The conventional ‘isolated’ view of the physical environment should thus be modified to include the social environment as child-initiated rather than staff-initiated play (cf. Brown et al. 2009).

According to Kyhälä, Reunamo, and Ruismäki (2012), a high degree of PA and learning takes place in highly variable and nonstructured learning environments, often created by children. When evaluating children’s PA, it is worth looking at both direct education and children’s activities in their personal contexts, which they have themselves helped to create. Children’s PA and skills should be considered as a social whole in which children’s mutual relations play an important role. Social interaction forms the basis for structured PA (Lehto, Reunamo, and Ruismäki 2012).

Methods

The purpose of the study was to investigate the dynamics of culturally mediated PA in day care and preschool. The research questions were as follows:

1. What are the environmental conditions for PA?
2. How is children’s PA related to their other skills and qualities?
3. What kinds of choices are related to children’s physical orientation?
4. What kinds of factors are related to the creation of a physically active learning environment?

Participants

In Finland, an average of 46% of all under school-aged children attended day care organized by their municipality in 2005 (Ministry of Social Affairs and Health 2006. 823 children participated in the study, of whom 143 were 1–3-year-olds, 380 were 4–5-year-olds and 280 were 6–7-year-olds (age was not reported for 20 children). The study included 78 children with special needs. There were 419 boys and 382 girls in the sample (gender information from the children’s skill evaluation was not reported for 37 children). The participants represented 50 day care centres or preschools attached to primary schools, with varying practices and pedagogy, in eight municipalities in southern Finland. There were units using Steiner and Montessori pedagogies, 24-hour day care centres, private and municipal units, and half-day preschools. In Finland, day care centre children are usually arranged into
groups, although the group composition and number of children can vary: In one unit, there were only nine children (including children with special needs), and in another, all 54 children belonged to the same group. Stratified sampling was used to select one group of children from each day care unit for the study. The exact number of parents who did not permit their child to participate in the research is not known, but the percentage of refusals was certainly under 10%. All children with parental permission in the selected groups participated in the research.

The participation of half of the day care centres was based on the choice of the staff, and for the other half, the choice was made by the municipality. This may have influenced the sampling; for example, in the former, less pedagogically interested day care centre staff may have chosen not to participate. However, in a comparison between the two types of choices, no meaningful differences could be detected. A couple of units cancelled their participation because of transfers or changes. The units represented the general population structure.

**Measures and procedure**

Observations and child evaluations were performed independently from each other. The observer and the child evaluators had no access to each other’s data. The observations were made during the children’s everyday activities. A great number of observations were needed in order to trace the connections between children’s PA and their strategies and skills.

**Observation**

According to Kohl, Fulton, and Caspersen (2000), several techniques have been used to assess PA among children, including self-report, direct observation, mechanical or electronic monitoring and direct or indirect calorimetry. Observation is an applicable method in the actual context and environment of the day care.

Seventy kindergarten teachers were trained to observe children. Because the observation had several categories and day care activities are difficult to define the training lasted the whole autumn semester of 2009. The training included four sessions with a one-month period for practising between the sessions. In the training, the teachers observed videos of everyday situations, and the observation categories were discussed one by one. There were 18,366 observations made between January and May 2010. The observers did not collect data in their own day care centres or groups (with one exception). The observations give a random sample of the children’s actions from 8:00 am to 12:00 noon in day care and preschool. The children were observed at four-minute interval according to systematic sampling methods. The actual observation lasted only one minute, and the rest of the time was used for coding and for preparing the next observation. Approximately, 60 observations were made in one day. Because the group sizes varied and children were sometimes absent, the number of observations per child also varied ($M = 22, SD = 13$).

The following observed items were general actions occurring between 8:00 am and 12:00 noon at the day care centre: the children’s actions; the children’s objects of attention; the children’s nearest peer contacts; the children’s PA; and the nearest educator’s actions. The children’s PA level was categorized into one of the three following categories:
(1) Low (sitting, using pen, eating etc.)
(2) Intermediate (walking, whole body movements)
(3) High (includes at least some running, romping, physical exertion etc.)

The reliability for the observed PA was evaluated during the last training session using seven videos: the observers were unanimous on the categories of 88% of the observations using the above three-category scale. The evaluation was difficult when the PA of the observed child varied during observation. For example, in one video where children were listening to the teacher’s instructions, the observed child was mostly sitting still but also made some whole body movements and one more intensive movement. Seventy-two per cent of the observers categorized the activity as intermediate, 23% as low and 5% as high. The children’s creative action was measured with the children’s involvement scale (Laevers 1994). The observation instrument was originally prepared for Reunamo’s (2007) preliminary research. This instrument can be retrieved from http://www.helsinki.fi/~reunamo/apu/observation_instrument.pdf.

Interview on children’s orientations

Reunamo’s interview tool (cf. Reunamo 2007) was utilized to study the children’s orientations in day care situations. The interviews were conducted by children’s own teachers who had been trained to use the interview tool. The interview consisted of sixteen situations. The children were asked to describe how they saw themselves acting in different situations, for example, Another child has the toy you want, what do you do? or You fail, what do you do then? A picture was used in each question to help the children to orientate to the situation at hand. Ten situations included other children, five included an adult and one situation a personal failure with no other participants. Most of the 1–2-year-old children were omitted from the interview, because the interview was too difficult for them. The interviewers wrote down the children’s answers. All the interviews were conducted in separate quiet rooms. After the interview, the answers were categorized into five groups of orientations: accommodative, participative, dominant, withdrawn and uncertain. If a child’s answer could not be categorized in any of the four first-mentioned categories, it was categorized as uncertain, which most often meant that the child did not know what to do in the situation. The classification was performed by two researchers, who categorized all the children’s views question by question (not child by child) to ensure a unified classification. The classifiers did not use any information about the children’s identity, neither did they use any information about the children’s qualities (e.g. age or gender), background, group or the learning environment of the day care they attended. The classification was made solely on the basis of the children’s descriptions. The reliability of the categories was not measured for the two raters, rather, the answers that were difficult to categorize were discussed and a shared understanding of the category was sought. The percentage of answers in each category was calculated. When the data were analysed, it was found that children often had different orientations for children than for adults. Different summary variables were added for situations with children and situations with adults. The interview instrument can be retrieved from http://www.helsinki.fi/~reunamo/apu/interview_instrument_with_pictures.pdf.
The child evaluations
The teachers of the groups evaluated the children’s skills, and personal qualities were rated on a five-point scale, including their fine motor skills, ability to adapt to new situations, confidence in the day care centre, metacognitive skills, ability to cope with their feelings, independence, sensitivity in interaction, language communication skills, social skills, coping strategies, concentration skills and use of will-power. The children’s gross-motor skills were evaluated with the statement *Needs a lot of support in gross motor development*. The child evaluation instrument can be retrieved from [http://www.helsinki.fi/~reunamo/apu/child_eval.pdf](http://www.helsinki.fi/~reunamo/apu/child_eval.pdf).

Statistical analysis
The observed data were merged with the interview data and the child evaluations. In the comparison of observation counts, Chi-square tests were used. In the comparison of group differences, Mann–Whitney tests were used instead of *t*-tests to eliminate possible violations in normal distributions. All the reported group differences in the article are highly statistically significant (*p* < 0.0005) unless stated otherwise.

Ethical considerations
The study was part of a research and development project designed to empower both educators and children. Educators were considered research colleagues in the dissemination of the research results. Educators were given feedback on tools for developing their work based on the research findings. Teams of educators received tools for pedagogical evaluation, and each team also received feedback on their group’s activities and interaction based on the preliminary results; a large-scale dissemination project is already under way. To ensure that the children expressed their own point of view their own teachers interviewed them. Valuing the children’s perspective was emphasized in the interview training. An assistant, e.g. a translator for immigrant children, was provided where necessary. Permission to participate in the research was gathered from all the families of the children. It is not possible to identify individual children in the data or results. The English webpages of the project are at [http://blogs.helsinki.fi/orientate/](http://blogs.helsinki.fi/orientate/). The development project is cooperating with the Finnish national organization for early childhood PA *Nuori Suomi*, see [http://www.nuorisuomi.fi/in_english](http://www.nuorisuomi.fi/in_english).

Results
Altogether 10.0% (*n* = 1829) of children’s activities were observed to be physically highly active, including at least some running, romping and physical exertion. Intermediate PA (for example, walking and whole body movements) was observed to be 33.6% (*n* = 6166) of their activities, and low PA accounted for 56.4% (*n* = 10,340) of the observations. The observed duration of high PA before noon (8:00–12:00) in day care and preschool was 24 min (10% of the time observed).

When focusing solely on high PA, boys were highly physically active in 11.5% of activities and girls in 8.3% of activities. Children’s PA increased with age: 1–3-year-old children were observed to be highly physically active 7.4% of the time and the percentage increased for 6–7-year-old children to 11.2%. Because boys and older children were more physically active, their impact is studied in the following
analysis to check their role as intermediate variables. However, all the intermediate variables may not occur in the analysis, because all the differences in physical activities cannot be checked which means that care is required when interpreting age and gender.

**PA in the learning environment**

The learning environment is where children come into contact with different physical activities. The distribution of children’s PA in daily activities can be seen in Figure 2.

More than half (57.1%) of high PA occurred during free play outdoors. Free play outdoors often refers to activities taking place in the playground or play park. Generally, children choose their activities themselves from several options. The second largest amount of high PA was observed during free play indoors (14.2%), although high PA during indoor play accounted for only 6.3% of all indoor play. In total, 71.9% of high PA occurred during free play activities, although only 40.4% of the time children spent in free play was high PA.

Direct education (teaching) included all kinds of educator-directed activities, including physical education, and involved such things as movement activities, gymnastics, dance, athletics, games and tasks. Even with physical education included in direct education, it accounted for just 13.5% of children’s total high PA, which is 6.8% of all teaching sessions. *Teacher scaffolding* was defined in the observation instructions as teacher participation that enriches children’s own processes and activities. Outdoor activity with a teacher scaffold consisted of 9.7% of children’s entire high PA, although children spent only 2.8% of their time in these activities. This means that teacher-scaffolded outdoor activities have the greatest density of high physical activities. Altogether, educator-directed activities (teaching, scaffolding, basic care and eating situations) accounted for 59.5% of children’s total time between 8:00 am and 12:00 noon but only 28.7% of their high physical activities.

Boys engaged in more outdoor high PA activities during teacher scaffolding (38.8%) than did girls (30.1%). The largest age difference was in outdoor free play,
in which 6–7-year-old children were highly physically active 36.5% of the time and 1–3-year-old children only 22.3% of the time.

ZPD is not a synonym for children’s learning environment. ZPD is the distance between children’s own activities, and the activities that children can engage in a supportive environment. ZPD describes how deeply children are involved in their activities within the environment. The relationship between children’s PA and involvement can be seen in Figure 3.

In simple, stereotypic repetitive and passive activities with no energy or cognitive demand (Figure 2), children were very seldom (in 2.3% of cases) highly physically active. The more children’s involvement is sustained, intense, concentrated, creative, persistent and includes mental engagement, the higher the percentage of high PA becomes, reaching 19.7% in the most sustained activity. High PA and high involvement seem to attract each other. However, which is the cause and which is the effect? It may be that during intense physical exertion children also become mentally involved in their activities. It is also possible that higher mental involvement evokes PA.

![Figure 3. Children’s PA in different levels of involvement.](image)

**Table 1.** Children’s mean involvement in low and medium PA and high PA in different activities.

<table>
<thead>
<tr>
<th>Day care activity</th>
<th>Mean involvement during low and medium PA</th>
<th>Mean involvement during high PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor activity with teacher scaffold</td>
<td>2.958</td>
<td>3.695</td>
</tr>
<tr>
<td>Outdoor free play</td>
<td>3.051</td>
<td>3.678</td>
</tr>
<tr>
<td>Direct education inside</td>
<td>3.272</td>
<td>3.789</td>
</tr>
<tr>
<td>Basic care</td>
<td>2.46</td>
<td>2.8</td>
</tr>
<tr>
<td>Indoor free play</td>
<td>3.245</td>
<td>3.494</td>
</tr>
<tr>
<td>Scaffolded play indoors</td>
<td>3.414</td>
<td>3.545</td>
</tr>
<tr>
<td>Eating</td>
<td>2.433</td>
<td>2.385*</td>
</tr>
</tbody>
</table>

*The difference is not statistically significant at the .0005 level.
A closer look at mental involvement in different activities (Table 1) shows that the interplay between PA and involvement is the strongest in outdoor activity. When children attended outdoor activities with a teacher scaffold, children’s mean involvement in PA was higher in comparison with lesser PA. Outdoor activity with a teacher scaffold seems to be a promising environment for intense learning. Furthermore, outdoor free play in general has a lot of involved high PA. It is worth noting that in those few cases \((n = 247)\) where children were highly physically active during direct education, their involvement was the highest. This means that direct education can be both physically and mentally intense at the same time, and they seem to reinforce each other. Unfortunately, these activities are very rare, accounting for only 3 min a day on average.

**Gross motor skills and personal qualities**

The educators were asked to evaluate children’s gross motor development in the following item: *Needs a lot of support in gross motor development.* About 47.8% of the children were evaluated as needing at least some support in gross motor development. The evaluated need for support in gross motor development decreased steeply with age: 76.3% of 1–3-year-old children were evaluated as needing at least some support in gross motor development, whereas only 35.3% of 6–7-year-old children were considered to need support in gross motor development. Boys were seen to be more often in need of at least some support in gross motor development (57%) than were girls (38.4%).

Children in need of at least some support in gross motor development were observed to be involved in high PA 9.5% of the time, whereas other children were highly physically active 10.4% of the time, \(\chi^2 (1, N = 17,969) = 3.593, p = 0.058\). The children who needed the most support in gross motor development (5 on a scale of 1 to 5) were observed to be highly physically active in only 5.3% of cases. Thus, children who need gross motor exercise the most get it the least. This tendency was observed in all age-groups, although the differences were not statistically significant, due to the small number of observations in high PA for children needing support \((n = 33)\).

Children’s gross motor difficulties are tightly interwoven with their other skills, as can be seen in Table 2.

The differences in Table 2 are the largest in children’s skills. Children with gross motor difficulties also have difficulties in adapting, both socially and to new contexts in general. These children also seem to have difficulties in their sensitivity. Gross motor difficulties seem to be very general symptoms connected to all aspects of a child’s personal life.

**Physical orientation**

Children’s PA was associated with their level of attention in their learning environment as can be seen in Figure 4.

Altogether, 62.6% of children’s high PA occurred when they attended to either a group of children (36.2% of all high PA) or to another child (26.4% of all high PA), which means that child-related activities were high in PA. A total of 33.4% of children’s high PA occurred when they attended to other things: 18.1% to the whole situation and 15.3% to non-social objects. Only 4% of high PA occurred when
children attended to an adult, even though these cases accounted for 13.2% of all observations. The result is clear: Other children are connected with high PA, adults with low PA.

The highest gender differences in PA were in attending to a group of children. Boys were highly physically active in 26.6% of cases where they attended to a group of children, but for girls attending to a group of children only accounted for 13.8% of high PA.

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Table 2. Differences in the mean values of evaluated personal qualities (1–5) in groups of children with no and at least some gross motor difficulties.

<table>
<thead>
<tr>
<th>Evaluated skill</th>
<th>No gross motor difficulties $M$</th>
<th>At least some gross motor difficulties $M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needs a lot of support in fine motor skills</td>
<td>1.47</td>
<td>2.8</td>
</tr>
<tr>
<td>Needs a lot of support in learning and metacognitive skills</td>
<td>1.77</td>
<td>2.9</td>
</tr>
<tr>
<td>Needs support in language communication skills</td>
<td>1.52</td>
<td>2.62</td>
</tr>
<tr>
<td>Withdraws easily, contacts with others are often weak</td>
<td>1.68</td>
<td>2.39</td>
</tr>
<tr>
<td>Recognizes the feelings of others and interacts sensitively</td>
<td>3.57</td>
<td>3.27</td>
</tr>
<tr>
<td>Recognizes own feelings and copes with them</td>
<td>3.48</td>
<td>3.05</td>
</tr>
<tr>
<td>Has willpower and uses it with other children</td>
<td>3.31</td>
<td>2.83</td>
</tr>
<tr>
<td>Is trusting and confident in the day care center</td>
<td>4.02</td>
<td>3.48</td>
</tr>
<tr>
<td>Has good social skills in a group of children</td>
<td>3.89</td>
<td>3.33</td>
</tr>
<tr>
<td>Adapts easily to new situations and other children</td>
<td>3.75</td>
<td>3.17</td>
</tr>
<tr>
<td>Is creative in pretend play</td>
<td>4.3</td>
<td>3.7</td>
</tr>
<tr>
<td>Can concentrate easily</td>
<td>4.05</td>
<td>3.42</td>
</tr>
<tr>
<td>Participates in and eagerly initiates activities</td>
<td>3.92</td>
<td>3.26</td>
</tr>
<tr>
<td>Copes appropriately in new, challenging situations</td>
<td>3.67</td>
<td>2.97</td>
</tr>
<tr>
<td>Is independent and self-directive</td>
<td>4.05</td>
<td>3.3</td>
</tr>
</tbody>
</table>

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Figure 4. The percentages of children’s different objects of attention during low/medium PA and high PA activities.
Age differences were also observed for children’s PA in relation to other children. 1–3-year-old children were highly physically active while attending to another child 31.1% of the time, while 6–7-year-old children’s PA was high 22.2% of the time, $\chi^2 (1, N=964) = 8.320, p<0.004$. Attending to one child seemed to be more physically stimulating for young children. On the other hand, when 6–7-year-old children attended to a group of children, their PA was high in 45.5% of cases, whereas with 1–3-year-olds, it was high in 25.6% of cases. This result highlights the developmental aspects of children’s peer contacts. The role of teachers is highlighted in Figure 5.

In the vicinity of the educator (0–1 m), children are rarely (only 3.0% of the time) highly physically active. However, when the distance to the nearest educator is greater than 10 meters, the children’s PA is high 29.5% of the time. This tendency is similar in all age groups. It is also similar for boys and girls, although for girls greater distance from the educator does not result in as high PA as for boys. We need more in depth study of the teachers’ activities to draw conclusions on the meaning of these results.

**Shared creation of PA**

Children who were observed to be highly physically active had a lower mean for evaluated withdrawnness ($M = 1.89$, $SD = 0.98$) than children with lesser PA ($M = 2.03$, $SD = 1.09$). This difference was observed for all three age groups, although the differences were not always statistically significant. The phenomenon was also similar for boys and girls.

There was also a significant connection between the independent measures of interview and observation. Children who were observed to be high in PA displayed fewer uncertain strategies with other children (12.3% of total strategies) than children with less high PA (14.2% of total strategies). This means that children’s uncertainty in their strategies with other children was reflected in lower PA. It is probable that when other children are the main instigators of high PA, withdrawn and uncertain children are excluded from these activities.
In free play outdoors, children have many opportunities to create their PA environment together with their peers, and they are usually free to choose their activity. Thus, it is important which activities children choose (cf. Figure 6).

Playing with toys or physically exploring the environment (material play) accounted for 43.1% of children’s time in free play outdoors, and 28.4% of play was highly physically active. Hanging about together accounted for 21.6% of children’s time, and it accounted for about a third of high PA. Roleplay was engaged in 14.7% of the time, and 38% of role play involved high PA. However, the highest density of high PA was in rule play: It accounted for a mere 4.6% of children’s time, but children were highly physically active for 76.7% of the time that they engaged in this activity. On the other hand, children were engaged in orientation (seeking for focus) for 9.9% of the time outdoors, but only 6.7% of the time spent in orientation was physically highly active. In free play indoors, children’s PA was very different, as can be seen in Figure 7.

Figure 6. Children’s main activities and the proportion of high PA in each activity during free play outdoors.

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Figure 7. Children’s main activities and the proportion of high PA in each activity during free play indoors.
The main activity in free play indoors was play or exploring with toys and the physical setting (material play), which accounted for 36.4% of their time. However, only 5.2% of this activity involved high PA. Children spent 24.5% of their playtime indoors in role play and imaginary play, but they accounted for just 8.3% of high PA. Hanging about with others accounted for 7.8% of children’s time, and 9.9% of that activity involved high PA. Indoor rule play (6.7% of the time) is very different from rule play outdoors, as it consists of just 6.9% high PA. ‘Action not allowed’ consisted of just 1.7% of children’s activities during free play indoors, but 29.4% of it involved high PA. This means that action not allowed is often associated with high PA.

Discussion
The results of this study are based on systematic and comprehensive sampling. The interview and child evaluation were independent measures from observation. The observers did not see the evaluations and interviews, and they did not discuss the observed children with the evaluators. A wide variety of day care centres and preschools were included in the study. However, a wider perspective of cultural aspects is not discussed here.

There are several findings from this study that should be considered in the development of PA for young children. The first finding is that there is too little PA. Only 24 min of high PA in the most active part of day between 8:00 am and 12:00 noon does not meet the recommendations for PA (Ministry of Social Affairs and Health 2005). The low level of PA observed here has been found elsewhere (cf. Pate et al. 2008). Another finding that cannot be ignored is that 71.9% of children’s high PA occurred during free play. Direct physical education and scaffolded activities accounted for just 2.5% of children’s high PA. It is worrisome that the tradition of physical education focuses on this 2.5% exercise sessions. Thus, the vast majority of children’s everyday PA may be neglected.

The results highlight the importance of children’s own production of PA. At the same time, it is essential to pay attention to the different needs of children, in order to promote motor competence. Let us recall that motor competence is a highly important factor for choices concerning a physically active lifestyle. Withdrawn and uncertain children need encouragement and experiences of success. The high level of PA during forbidden activities needs more attention. The high level of involvement that children display in high PA indicates that high PA can be a valuable tool for learning.

Children’s gross motor skills seem to be highly intertwined with their personality and other skills. Children who need physical support the most may receive it the least. PA is often the best remedy for cognitive, social and emotional well-being.

Teachers need to rethink their role as educators. They should not consider themselves the only providers of PA, even though they play a significant role in evaluating and enhancing motor development. The dynamics of children’s PA is central. Teachers need to empower children to take responsibility for their own well-being and help them build a sustainable and healthy culture that is shared by everybody.

One finding was that children are more physically active the further away they are from their teachers. However, this does not mean that educators should leave children on their own. Children who happily and actively play football or tag can keep on playing. However, timid, clumsy, uncertain children with weak peer
contacts need teachers to help them become involved in the shared production of PA. Younger children’s interest in PA is best ignited by one friend; the interest of older children, especially boys, is more easily ignited by a group of children.

The important changes needed to create more comprehensive PA are possible. Children need more free play outdoors. Outdoor play scaffolded by a teacher is a great way to enhance PA. Moreover, special attention should be given to girls’ PA when scaffolding play. Children spend a lot of time in material play. By giving children real, heavy tools to work with, the amount of PA can be increased. Rule play outdoors was the best physical activator. Readily available equipment and a teacher who helps to get play started are methods to increase the amount of PA.

When examining the results in the light of the feedback loop of culturally mediated PA, the following picture emerges: free play outdoors and, to a lesser degree, free play indoors are potential environments for PA. Culturally mediated gross motor skills are combined in many ways in children’s personal, emotional and social skills. Children’s gross motor skills impact on every aspect of their well-being. Children’s physical orientation becomes concrete with one or more peers, especially in their choices of friends away from the teachers. In the shared creation of PA, children create their own physical environment with their peers in material play, role-play and hanging about with others. Withdrawn and uncertain children are easily left out of shared activities. Eventually, at the end of the feedback loop, the zone of proximal PA looks different. In this new environment, teachers not only adapt teaching to the children; rather, they help children to control and enhance the flow of their own PA.

According to McWilliams et al (2009), policy makers and childcare providers would benefit from more specific PA recommendations and standards. Establishing comprehensive guidelines for PA in childcare could result in higher activity levels and healthier children. However, these recommendations should not obscure the potential of children’s own role in PA creation presented in this article.

References


