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Children's voices in the schoolyard

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Publication date:
2016

Document version
Publisher's PDF, also known as Version of record

Citation for pulished version (APA):
Pawlowski, C. S. (2016). Children's voices in the schoolyard: A qualitative study of factors influencing children's physical activity behavior during recess. Syddansk Universitet. Det Sundhedsvidenskabelige Fakultet.

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Children's voices in the schoolyard

A qualitative study of factors influencing children's
physical activity behaviour during recess



PhD thesis

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Faculty of Health Sciences

University of Southern Denmark

2016

PhD thesis

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Research unit for Active Living

Department of Sports Science and Clinical Biomechanics

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Odense, 2016



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Odense, 2016

Submitted January 2016

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Acknowledgement:

The Danish Cancer Society funded the research presented in this thesis.

Front cover graphics: All photos were taken by children participating in the study and show what they were doing during recess.

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Preface and acknowledge

The work presented in this thesis was carried out between 2013 and 2016 at the Faculty of Health Sciences, University of Southern Denmark. Working on this thesis has been a very exiting journey to many unknown countries far away. I learnt to swim in deep water and have developed myself both as a researcher and personally.

However, I was not alone on this journey. A lot of people have helped me along the way in this thesis. I wish to thank my supervisors Jens Troelsen, Jasper Schipperijn and Tine Tjørnhøj-Thomsen for being my guides throughout my journey. As a young girl my dream was to be an anthropologist but I ended up in Health science. Special thanks to Jens for choosing me and making my dream come true mixing these two fields. Also, thank you for being my supportive and protective ‘granddad’ whom I could go to when frustrations occurred. Jasper, without you, I would never have travelled this far. Thank you for all your very pleasant advices throughout my writing process and thank you so much for introducing me to your huge network of excellent international researchers. Your optimism and work approach have been a driving force for me. Tine, I am extremely grateful that you would also be my travel partner. I truly like your pragmatic approach and you made me believe in myself even though I felt very green methodically at the beginning of my PhD journey. Every time I went back home from our Copenhagen meetings I felt I had developed my methodical skills. Thank you.

I also want to thank my co-authors that helped sharpen my papers. Henriette Bondo Andersen, my dear buddy, Christina Ergler and Scott Duncan. Scott, also thanks for introducing me to your lovely country, New Zealand.

Furthermore, I would like to thank a range of other people from the Research unit for Active Living, for your academic input and in particular for making it feel fun to go to work. Else, I enjoyed our writing retreats at Gerlev Idrætshøjskole and Mette I loved being your conference roommate. Also thanks to Center for Intervention Research in Health Promotion and Disease Prevention for hosting The Activating Schoolyards Study and me.

And most important, a special thanks to all the principals, teachers, children and their parents at the schools I have been visiting. Without your contribution neither this thesis, nor The Activating Schoolyards Study would have been realised.

Finally, thanks too to my great friends; Ann Louise, Jette and Nete, for sharing champagne for every accepted paper and my lovely family; Kasper, Freja and Frida, who often have suffered from my prioritisation of work time, but still supported me. Mum and dad, I know you are very proud of me.

This research was made possible by funding received from a partnership between The Danish Cancer Society, Realdania, and The Danish Foundation for Culture and Sports Facilities.

Charlotte Skau Pawlowski

Odense, January 2016

List of papers

Paper I:

Pawlowski CS, Tjørnhøj-Thomsen T, Schipperijn J, Troelsen J. *Barriers for recess physical activity: a gender specific qualitative focus group exploration*. BMC Public Health 2014,14:639.

Paper II:

Pawlowski CS, Ergler C, Tjørnhøj-Thomsen T, Schipperijn J, Troelsen J. *'Like a soccer camp for boys'. A qualitative exploration of gendered activity patterns in children's self-organized play during school recess*. European Physical Education Review 2014;21(3):275–91.

Paper III:

Pawlowski CS, Schipperijn J, Duncan S, Troelsen J. *Promotion of physical activity among children: can we learn from New Zealand recess practices?* Forum for Idræt 2015, 31. Årgang, nr. 1, 9-21.

Paper VI:

Pawlowski CS, Andersen HB, Troelsen J, Schipperijn J. *Children's physical activity behaviour during school recess: a pilot study using GPS, accelerometer, participant observation, and go-along interview*. PlosOne 2016,11(2): e0148786.

Paper V:

Pawlowski CS, Andersen HB, Tjørnhøj-Thomsen T, Troelsen J, Schipperijn J. *Body, time, space and relationship experiences of recess physical activity: a qualitative case study among the least physical active schoolchildren*. BMC Public Health 2016,16:16.

List of appendices

Appendix I: The Activating Schoolyards Study design paper

Andersen HB, Pawlowski CS, Scheller HB, Troelsen J, Toftager, M, Schipperijn J. *Activating schoolyards: study design of a quasi-experimental schoolyard intervention study*. BMC Public Health 2015 15:523

Appendix II: Example of an active informed consent form to parents (in Danish)

English summary

Background: Many children in Denmark and other Western countries do not reach the recommended level of daily physical activity. School recess provides a unique opportunity for children to be physically active and it can provide a large contribution to children's overall level of physical activity. However, facilitators and barriers to recess physical activity are not well understood. To date, research on recess physical activity has predominantly focused on quantitative measures, using cross-sectional surveys and school-based intervention studies. A potential problem with quantitative surveys is that they typically focus on a narrow set of predefined factors identified by adults. To really understand the factors affecting recess physical activity it is crucial to observe and listen to children to know how they engage in and perceive recess physical activity. The aim of this thesis was to gain knowledge on children's perceptions and experiences of factors influencing their physical activity behaviour during recess. The findings were used in the developing phase of The Activating Schoolyards Study, a schoolyard intervention study aiming to increase children's recess physical activity, particular for the least physically active children.

Method: An ethnographic fieldwork informed by a social constructionist paradigm became the methodology of choice. The empirical data were collected in three separate studies using a multitude of different qualitative methods with the emphasis on child participant methods such as participant observation, go-along group interview and participatory photo interview to involve the children in the explorations of their own daily recess world. The studies were conducted among 10-13 year-old children (grade 4-6) in the 17 schools in Denmark included in The Activating Schoolyards Study, and in five schools in New Zealand. The overall theoretical framework behind my research was a comprehensive socio-ecological model positing that physical activity behavior results from multiple influences.

Results: Twelve factors were identified to influence the children's recess physical activity: 1) bodily self-esteem and ability, 2) gender, 3) gendered school culture, 4) peer influence, 5) conflicts and exclusion, 6) space and place experiences, 7) lack of play facilities, 8) outdoor play policy, 9) use of electronic devices 10) recess duration, 11) organised activities, and 12) weather. These factors were located within different layers of the socio-ecological model (i.e., individual, social/cultural, physical, political, and natural environmental factors), but they were interdependent. Apart from showing the complex interrelations between the different factors, my findings indicate that researchers and professionals working with children's recess physical activity should be aware of different

perceptions and not treat children as one homogeneous group in future recess interventions promoting recess physical activity.

Conclusion: The findings speak for implementing a combination of actions addressing factors from different layers in the socio-ecological model simultaneously to increase recess PA among all types of children. For example, by combining fostering self-believe in children lacking bodily self-esteem, with implementing school policies supporting outdoor physical activity during recess in all weather conditions, or rethinking indoor spaces as spaces for physical activities. Designing schoolyards with smaller secluded spaces without predefined activities, combined with prolonging the recess duration, regulating the use of electronic devices during recess, or organising teacher controlled recess activities and student driven play equipment stations.

Dansk resumé

Baggrund: Mange børn i Danmark og andre vestlige lande opnår ikke de anbefalede 60 minutters fysisk aktivitet om dagen. Frikvarteret byder som institutionel ramme på en unik mulighed for at fremme fysisk aktivitet blandt børn, eftersom frikvarterets aktivitet har vist at være en af de største bidrag til børns totale fysiske aktivitetsniveau. Dog er der ikke endelig klarhed om hvilke faktorer, der fremmer og hæmmer fysisk aktivitet i frikvarteret. Hidtil har forskningen i fysisk aktivitet i frikvarteret primært været fokuseret omkring interventionsstudier med kvantitative målinger. Kvantitative undersøgelser fokuserer typisk på få prædefinerede faktorer udpeget af voksne. For at forstå de faktorer, som påvirker børns fysiske aktivitet i frikvarteret, er det afgørende at få kendskab til børnenes frikvarteretsadfærd og oplevelser af frikvarteret ved at observere og lytte til børnene. Formålet med denne afhandling var at opnå viden omkring børns oplevede faktorer med indflydelse på deres fysisk aktive adfærd i frikvarteret. Fundene blev brugt i planlægningen af strategier til fremme af fysisk aktivitet i frikvarteret i interventionsstudiet Drøn på Skolegården, som har til formål at fremme fysisk aktivitet i frikvarteret primært blandt de mindst fysisk aktive børn.

Metode: Det metodologiske udgangspunkt for afhandlingen var et etnografisk feltarbejde funderet på et socialt konstruktivistisk paradigme. Det empiriske datamateriale blev indsamlet i tre separate studier. Ved brug af forskellige kvalitative metoder såsom deltagerobservation, gående gruppeinterview og fotobaseret interview blev fokus rettet på børnenes aktive deltagelse i frikvarterets praksis. Undersøgelserne blev gennemført blandt 10-13 årige børn (4.-6. klasse) på de 17 skoler i Danmark, som var inkluderet i Drøn på Skolegården samt fem newzealandske skoler. Den socio-økologiske model, som forudsætter at fysisk aktiv adfærd er multifaktorielt påvirket, dannede den overordnede teoretiske ramme for undersøgelserne.

Resultater: Der blev identificeret tolv faktorer med indflydelse på børnenes fysiske aktivitet i frikvarteret: 1) Kropslig selvværd og evne, 2) køn, 3) kønnet skolekultur, 4) påvirkning fra venner, 5) konflikter og eksklusion, 6) plads- og stedsoplevelse, 7) mangel på legefaciliteter, 8) understøttelse af udendørsleg, 9) brug af mobiltelefon og tablets, 10) frikvarteretslængde, 11) organiserede aktiviteter og 12) vejret. Disse faktorer er fra forskellige lag i den socio-økologiske model repræsenterende både individuelle, social/kulturelle, fysiske, politiske og natur-miljømæssige faktorer, men var indbyrdes afhængige af hinanden. Baseret på fundene bør forskere og andre professionelle, der arbejder med børns fysiske aktivitet i frikvarteret udover det komplekse forhold faktorerne i mellem endvidere være opmærksomme på, at der er forskellige grupper af børn med forskellige oplevelser af hvilke

faktorer, der påvirker deres fysiske aktivitet i frikvarteret.

Konklusion: Fundene taler for at implementere en kombination af interventioner, som retter sig mod faktorer fra forskellige lag i den socio-økologiske model for at øge det fysiske aktivitetsniveau i frikvarteret blandt alle typer af børn. Det er således et spørgsmål om at operere på flere samtidige niveauer, hvor der eksempelvis arbejdes på at skabe en tro på kropslig kunnen blandt børn med lavt kropslig selvværd forenet med implementering af skolepolitikker, som understøtter leg udenfor i al slags vejr eller, betænker indendørsrum til fysisk aktiv brug. Det kan være at designe skolegårde med mindre afskærmede rum uden prædefinerede aktiviteter og samtidig forlænge frikvarterne, gennemføre regulativer for brug af mobiltelefon og computer i frikvarteret eller organisere lærer-kontrollerede frikvartersaktiviteter og elevdreven udlån af legeudstyr.

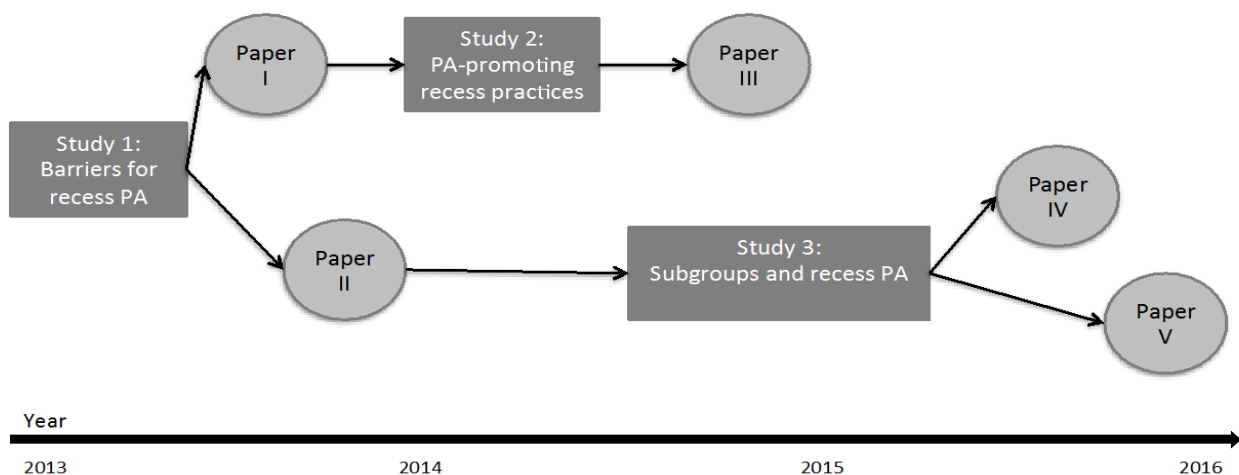
Abbreviations

BMI	Body mass index
GPS	Global positioning system
MVPA	Moderate to vigorous physical activity
PA	Physical activity
PE	Physical education
VPA	Vigorous physical activity
WHO	World Health Organization

1. Presentation of the thesis

The thesis presents my underlying methodological and theoretical foundation of the research and the overall conclusions based on a synthesis of five published papers. Writing this overall part of my thesis has been an instructive retrospect of my three years of research. Even though my overall thesis aim and epistemological position have remained constant throughout the research process, I have developed my approach along the way as I got deeper into my analyses and the research field of recess physical activity (PA). Results from one completed study repeatedly provoked my curiosity to test different methods and search for new specific knowledge in the field of recess PA. The thesis is based on five papers utilizing empirical data collected in three separate studies to gain specific knowledge about factors influencing children's PA behaviour during recess. Figure 1 reflects my exploratory research process in chronological order.

Figure 1. An overview of the exploratory approach developed during my thesis work



Study 1 focused on children's perceived barriers for recess PA and how this was influenced by gender and social grouping, and it led to *paper I* and *II*. Each of the papers called for further investigations to get deeper into the explored field and led to two new data collections. Study 2 focused on PA-promoting recess practices in the New Zealand school setting, which was compared to the Danish school setting, and resulted in *paper III*. Study 3 explored PA behaviour during recess among different groups of children, particularly the least physically active children, and resulted in *paper IV* and *V*.

The thesis was linked to a schoolyard intervention study, The Activating Schoolyards Study, by adding knowledge about factors influencing children’s PA behaviour during recess to the developing phase of that study (see design paper, appendix I). It has been a driving force in my whole thesis to conduct practice-oriented research with a health perspective. Common to all five papers is that they end with contributions to initiatives promoting recess PA aiming to make the findings transferable to practice.

The methods used in the three studies differed, but throughout my thesis work I focused on the children’s perspective, and I developed my research skills using different child participatory approaches along the way. As the first author of all the work presented in this thesis, I had the primary responsibility for all the data collections and analysis. However, parts of the third data collection used for *paper IV* were conducted as a mixed methods study in a partnership and I was only responsible for the qualitative data collection and analysis. Thus, this thesis only presents descriptions of the qualitative methods used in *paper IV*. Table 1 provides an overview of the three studies included in the thesis.

Table 1. An overview of the three studies that form the empirical basis for this thesis

Study	Study 1: Barriers for recess PA	Study 2: PA-promoting recess practices	Study 3: Subgroups and recess PA
Setting	17 schools in Denmark	5 schools in New Zealand	1 school in Denmark
Period	April-June 2013	February-March 2014	June 2014 + February-March 2015
Methods and volume	17 days of participant observation 17 focus groups (incl. go-along group interview)	15 days of participant observation (incl. informal talks)	13 days of participant observation 3 go-along group interviews 16 participatory photo interview 81 Accelerometer + GPS measurements*
Target group	10-11 year-old children (grade 4)	Children attending primary school (5-14 year-old children, grade 1-8)	10-13 year-old children (grade 4-6), with a main focus on 11-12 year old children (grade 5)
Foci	Perceived barriers for PA, gender and social grouping during recess	Comparison between the Danish and New Zealand school setting in relation to promote recess PA	PA behaviour and experiences during recess among different PA groups
Paper	I + II	III	IV + V

*A research team collected the data in Study 3 using mixed methods. I collected the qualitative data and the quantitative data were not part of this thesis.

1.1 Thesis outline

The thesis starts with an *introduction* that sets the scene and introduces key concepts and the research area, followed by the aim of the thesis and the research objectives, ending with a description of my theoretical framework. A *scientific approach section* follows, allowing for a description of the basic scientific elements: my epistemology, methodology and research position, together providing the foundation for my research. In the *method section*, methodical considerations such as setting, population, data collection procedures, analysis, and ethics are presented. The *result* and *discussion section* respectively, present a synthesis of the main findings, discussed in relation to findings from previous studies, and highlights strength and limitation of the research. Finally, the *conclusion* sums up the main findings of the thesis and addresses practical implications and future research.

2. Introduction

2.1 Children and physical activity

Current scientific evidence documents that regular PA provides fundamental health benefits for children. The health benefits of sufficient childhood PA include improved psychological well-being (Rothon et al., 2010), higher bone density (Tobias et al., 2007), better motor skill development (Lubans et al., 2010) better cognitive performance (Fedewa and Ahn, 2011), reduced waist circumference, less clustering of cardiovascular disease risk factors (Andersen et al., 2006), and lower levels of body fat mass later in life (Janz et al., 2009). Moreover, research has shown that children's self-organised physically active play in outdoor areas, such as schoolyards, gardens and parks, develops their social and creative skills (Sawyers, 1994).

Despite the benefits of PA, a significant number of schoolchildren in Denmark and other Western countries do not reach the World Health Organization's (WHO) recommended minimum level of 60 minutes of daily moderate-to-vigorous physical activity (MVPA) (Currie et al., 2012). And PA declines significantly between the ages of 9 and 15 years old (Nader et al., 2008; Dumith et al., 2011). A Danish longitudinal study found that PA decreased approximately 30% between the ages of 9 and 15 (Kristensen et al., 2008), and the latest national survey indicates that among Danish 11 year olds only 26% of girls and 39% of boys adhere to these global guidelines (Rasmussen et al., 2015).

Health authorities are concerned with the decreasing PA from childhood to adolescent since PA patterns in early life are likely to track into adulthood (Andersen et al., 2004; Kristensen et al., 2008; Telama et al., 2005). Therefore, the importance of long-term public health benefits of increasing children's PA is clear and governments, both in Denmark and other Western countries, are requesting effective policies, research and health promotion programmes aiming at increasing PA in children (MacDougall et al., 2004; Pedersen and Andersen, 2011).

2.2 Recess physical activity

Schools have long been recognised as key settings to provide possibilities for children to be physically active (Dobbins et al., 2013; Cook et al., 2013; Martinez-Andres et al., 2012). Firstly, children spend a substantial amount of their waking hours at school (Broekhuizen et al., 2014), which has health as an integrated part of the curriculum, e.g., by means of physical education (PE) (Dobbins et al., 2013; Naylor and McKay, 2009). Secondly, schools have the potential to reach and influence a

large number of school-aged children from all risk groups as almost all children attend school (Ridgers et al., 2006b; Dobbins et al., 2013). Thirdly, the school setting is a social system with strong group dynamics (Naylor and McKay, 2009; Thorne, 1993). If an intervention is effective in changing a behaviour or a mind-set of some children, it is likely that it will spread to other parts of the social system as peer influence in decision making is strong among schoolchildren (Naylor and McKay, 2009).

In particular targeting school recess has been found to be important as school recess can provide a large contribution to children's overall daily level of PA (Nielsen et al., 2011; Ridgers et al., 2006b). A review showed that school recess could contribute with up to 40% of schoolchildren's recommended daily PA levels (Ridgers et al., 2006b).

2.3 Differences in recess physical activity

For the least physically active children recess PA is found to provide a valuable contribution to overall school day PA as these children are found to be more physically active during school hours than after school (Erwin et al., 2012; Fairclough et al., 2012; Cox et al., 2006). In general, studies describe obese children as less physically active during recess (Fairclough et al., 2012; Brusseau et al., 2011; Ridgers et al., 2010). Evidence also shows that girls, in general, are less physically active during recess than boys (Ridgers et al., 2012; Brusseau et al., 2011; Sato et al., 2012). However, in most school-based interventions aiming to promote recess PA the children were not grouped based on their daily PA levels (Toftager et al., 2014; Parrish et al., 2013; Escalante et al., 2014; Broekhuizen et al., 2014; Ickes et al., 2013), and it is unclear if the interventions were equally effective for all children, or if they only appealed to the children who were already physically active. Therefore, an in-depth exploration of children's PA behaviour and experiences during recess is required (Dobbins et al., 2013; van Sluijs et al., 2007; Metcalf et al., 2012; Martinez-Andres et al., 2012). Providing a more complete picture of children's PA behaviour during recess can further qualify intervention studies as effective interventions can only be designed when behaviours and environments are understood (Hornby-Turner et al., 2014).

To date, research on recess PA has predominantly focused on quantitative measures, using cross-sectional surveys and school-based intervention studies (Ridgers et al., 2012). A potential problem with quantitative measures is that they typically focus on a narrow set of predefined factors identified by adults. Sociological researchers are increasingly aware that there are gaps in our understanding of children's perspectives (Morrow, 1999). To really understand the factors affecting PA it is crucial to

observe and listen to children to understand their acts and perspectives (Darbyshire et al., 2005; MacDougall et al., 2004).

2.4 Aim and research objectives

The overall aim of this thesis is to gain knowledge of children's perceptions and experiences of factors influencing their PA behaviour during recess.

Each of the five papers included in the thesis has its own specific perspective and research objective contributing to the overall aim. The objectives were:

- *Paper I:* To explore gender differences in children's perceptions of barriers to recess PA by using a qualitative approach and with the socio-ecological model as a theoretical framework.
- *Paper II:* To explore how construction of gendered activity patterns and social positions in the schoolyard lead to gender reinforcing practices in self-organized play during recess.
- *Paper III:* To identify possible PA-promoting recess practices at New Zealand schools that could be transferrable to Danish schools.
- *Paper IV:* To gain in-depth knowledge of children's PA behaviour during recess using a mixed-methods approach combining the quantitative measurements GPS and accelerometer with qualitative go-along group interviews and participant observations
- *Paper V:* To explore the least physically active children's lived experiences of four existential lifeworlds linked to PA during recess: space, body, time, and relations.

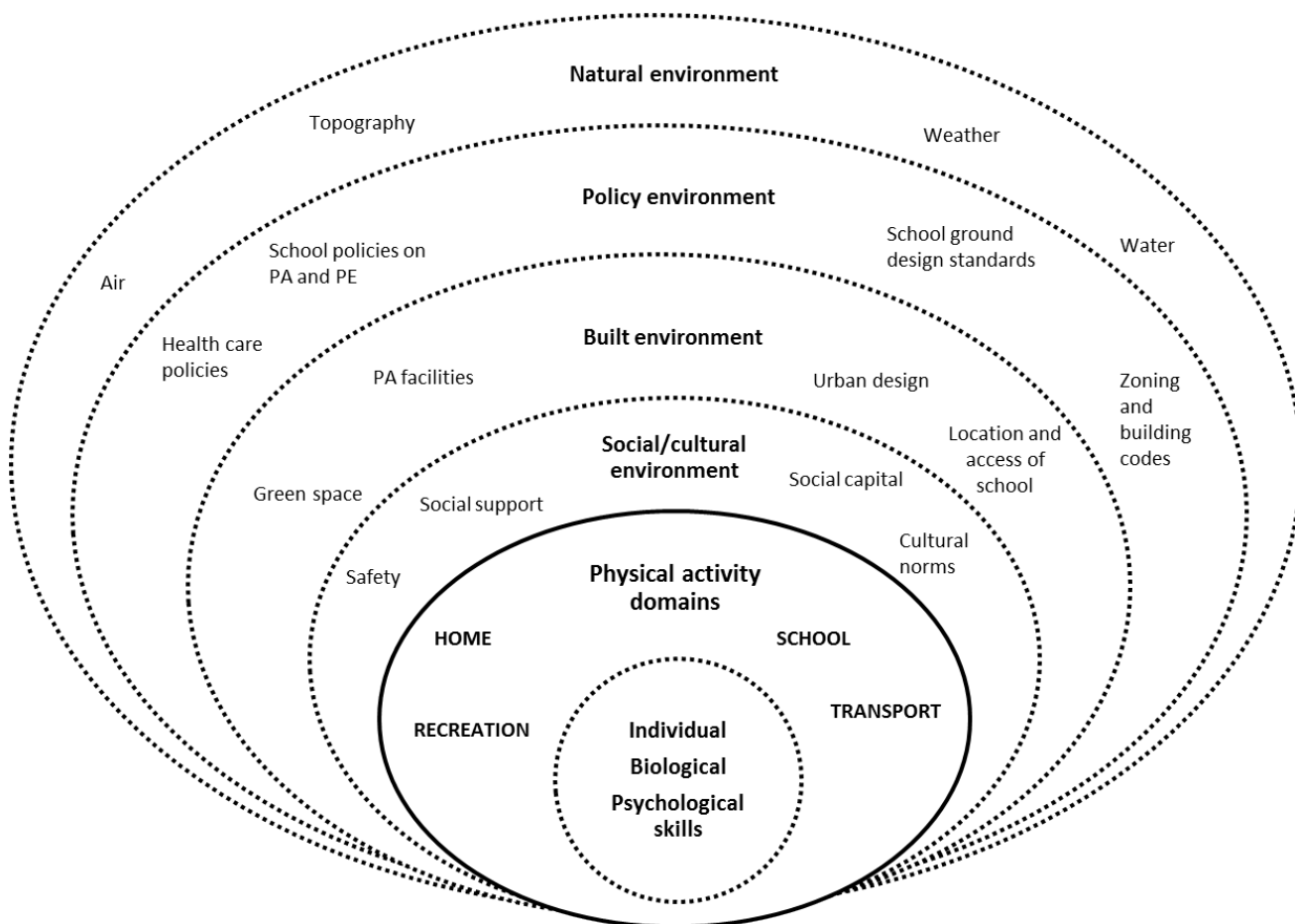
2.5 The socio-ecological model as framework

Numerous behavioural theories and models have been used to guide the understanding of factors affecting PA. Most behavioural theories have focused on individual factors such as gender, age, self-confidence and health perception (Lenthe and Brug, 2010). Within the past decades evidence emerged that environments impact our behavior, including our inclination to engage in PA (Lake and Townshend, 2006; Lake and Townshend, 2013; Giles-Corti, 2006), which has led to the emerging of socio-ecological models in the field (Sallis et al., 2008). By developing an ecological systems theory of child development, the developmental psychologist Bronfenbrenner was one of the first to call

attention to the large number of environmental and societal influences on child development (Bronfenbrenner, 1979).

The core concept of a socio-ecological model is that behaviour has multiple levels of influences, typically intrapersonal (biological, psychological), interpersonal (social, cultural), built environmental, and political influences (Sallis et al., 2008). Socio-ecological models provide comprehensive frameworks for understanding the multiple and interacting factors of health behaviours and can be used to develop comprehensive interventions that systematically target mechanisms of change at each level of influence (Sallis et al., 2008). A socio-ecological model is not a theory in itself, but should be seen as an effective way to organise theoretical constructs for a problem-driven approach to change behaviour (Bartholomew et al., 2011). In line with this, I have used the socio-ecological model as an underlying framework during my analyses to systematically study the multiple factors found influencing the children’s PA behaviour during recess. Figure 2 shows the socio-ecological model used in this thesis, adapted from Sallis et al. (Sallis et al., 2006).

Figure 2. A socio-ecological model with four domains, adapted from Sallis et al. 2006

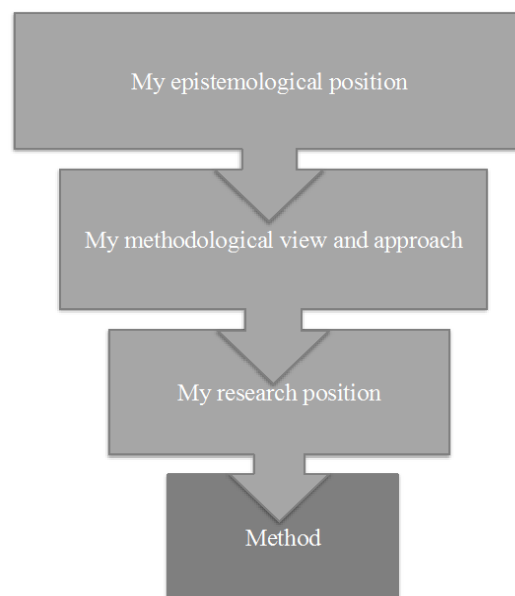


The model operates with four different domains: home, school, recreation/leisure and transport (Sallis et al., 2006) and illustrates that individual skills, social/cultural environment, built environment, policy and climatic conditions influence PA in each of these four domains. For example, gender, age and self-efficacy are known associates of child PA at the individual level and social support from parents and peers are known correlates of PA in children at the social level (Bauman et al., 2012). In the school domain, relevant built environmental and policy environmental correlates of PA are, for example, access to PA facilities and equipment, schoolyard space and a written PA policy (Haug et al., 2010a; Haug et al., 2010b; Ridgers et al., 2012). Finally, the natural environment in and around the school also influences participation in PA. Especially the weather is found to affect recess PA (Stanley et al., 2012). In relation to my thesis work, I have solely focused at the school domain in my attempt to understand the children's experiences and interaction with their recess environment.

3. My scientific approach

In this section I elaborate on the underlying scientific approach that I have used in my thesis. Figure 3 is a model modified from Crotty (Crotty, 1998) illustrating the three basic elements with implications for my choice of methods: my epistemological position, my methodological view and approach, and my research position. Together they compose the foundation of my thesis and have inspired and guided the whole research process. All three elements informed my choice of methods, described in the subsequent section. The structure is hierarchical showing that each element is dependent on the element above.

Figure 3. The three basic elements composing the foundation of my research, adapted from Crotty 1998



The section is divided in three subsections concordant with the three basic elements. First, my epistemological position is presented, followed by my methodological view and approach that lies behind my epistemology. Next, I describe my research position in relation to my view upon the children explored. I will explain how these three basic elements form my scientific theoretical approach and how they determine the content for my research.

3.1 Recess physical activity is socially constructed – my epistemological position

In line with social constructionism (Burr, 1995), I consider the world and all human realisation to be socially constructed (my ontological viewpoint). According to Crotty, my epistemological position is

deeply anchored in my way of looking at the world and how I understand it (Crotty, 1998). This makes my epistemological position my point of departure for my research process. Social constructionism has its roots in the symbolic interactionism that believes that human beings construct reality through social processes in everyday life interactions (Gergen, 1999; Andrews, 2012). This means that reality does not exist as a meaningful object independently of consciousness and experience like in objectivism (Schwandt, 2003; Crotty, 1998). However, even though I see reality as a social construct I do not fully deny objectivity. For example in *paper II*, I lean on a social constructionist gender viewpoint using the concept “doing gender” to argue for the fact that gender conforming activities are constructed through the children’s everyday interaction here among socialisation, in the schoolyard (Kessler and McKenna, 1978; Thorne, 1993; West and Zimmerman, 1987), but I do not deny that gender exists in a biological sense as expressed in the term “sex”. Berger and Luckmann (1991) also view the world as both an objective and a subjective reality. They argue that any frequently repeated action is cast into a pattern which can be reproduced. In time, the meaning of an action develops into a habit and becomes embedded as a routine, forming a general knowledgebase. This is institutionalised by society to the extent that future generations experience this type of knowledge as objective. Additionally, this objectivity is continuously reaffirmed in the individual’s interaction with others (Berger and Luckmann, 1991).

A main focus of social constructionism is to uncover the ways individuals and groups participate in the construction of their perceived social reality where language is the most essential system through which humans construct their reality (Burr, 1995). In accordance with social constructionism, my intention was to listen to the children and look at the ways recess PA, as a social phenomenon, was perceived, created, institutionalised and made into tradition by the children. The social world during recess consists of the children’s socially constructed realisation of this recess world. I was particularly aware that the social construction of reality during recess was an on-going dynamic process that was reconstructed by the children acting on their interpretations and their knowledge of it. And at the same time the children were embedded in diverse meaning structures guiding their understanding of how the world is constructed (Gergen, 1999; Burr, 1995). In this process it is clear that children from different cultures (e.g., countries, schools and subgroups of children) may construct meaning in different ways, even in relation to the same phenomenon (Crotty, 1998). For that reason, I found it important to study different perspectives of the explored phenomenon among children from different countries, schools, and subgroups to get an in-depth exploration.

3.2 Recess physical activity is an interpreted phenomenon – my methodological view

A hermeneutic phenomenological methodology was used as the scientific basis for my thesis, following my social constructionist viewpoint. Sharing the view that reality is not an objective fact intertwines social constructionism and hermeneutic phenomenology (Crotty, 1998). The basic principle of hermeneutic phenomenology is that we are involved in our world and experience it as meaningful because our world, with its other people, its histories and cultures, and its events, precedes any attempt on our part to understand it or explain it (Laverty, 2003; Dowling, 2007; Van Manen, 1990). Phenomenology becomes hermeneutical when its methods are taken to be interpretive. This orientation is evident in the work of Heidegger who argues that all description is always an interpretation. Every form of human awareness is interpretive (Dowling, 2007). The purpose of hermeneutic phenomenological research is, through a process of understanding and interpretation to bring to light and reflect upon the lived meaning of basic experiences that may be taken for granted in our everyday lives (Wilson and Hutchinson, 1991).

The use of hermeneutic phenomenology in my thesis allowed for an interpretive process back and forth to gain an in-depth understanding of the children's perceived and experienced daily recess life. In so doing, this methodology provided a vehicle for deepening my understanding of the explored phenomenon.

One of the first to adopt hermeneutic phenomenology as a distinct research methodology was Max van Manen. He developed a methodology of four existential lifeworlds: lived space, lived body, lived time, and lived relations, which pervade the fundamental structure in the lifeworld of everybody, independent of history and culture (Van Manen, 1990; Dowling, 2007). In the very beginning of my thesis work I was introduced to Van Manen's thinking, which, to me, gave meaning to my research work by structuring my reflections towards the phenomenon explored in the four existential lifeworlds. Even though I first explicitly used Van Manen's hermeneutic phenomenological thinking in *paper V*, his work provided the fundamental methodology in my research.

3.2.1 Ethnography to explore the phenomenon – my methodological approach

To gain my hermeneutic phenomenological view of the children's recess perceptions and experiences I was inspired by ethnographical fieldwork. Ethnography is the systematic study of people and cultures designed to explore cultural phenomena (Wolcott, 2008; Hammersley and Atkinson, 2007) offering excellent insight into the children's daily recess life. For example, the physical and institutional setting in which the children are present and their daily routine of activities and the

beliefs that guide their actions (Eder and Corsaro, 1999). Particularly observing the children's body in (non) action and learning about their social norms and patterns gave me a unique insight in the children's recess world. Ethnography was used as an attempt to understand the culture of the children from the "inside", through the eyes and ears of the research subjects, achieved by immersing myself in the children's recess world.

3.3 Children are interpretative individuals - my research position

Helping children to articulate their opinions about their social lives is a crucial factor in improving health and well-being of children (Darbyshire et al., 2005). Consequently, a dialogue with children about matters concerning their quality of life should be considered not only a basic right, but also a precondition for their health promotion (MacDougall et al., 2004). However, until date it is most common to conduct adult-focused research and to adapt strategies for adults to children (MacDougall et al., 2004). The literature addresses the devaluing of children's perspectives and calls for children's voices to be heard (Dockett, 2000; MacDougall et al., 2004). The importance of listening to children is also supported by Rasmussen who found a clear difference in what children and adults characterised as a place for play (Rasmussen, 2004).

An ideology in line with this point of view is "the new child paradigm" introduced by anthropologist Allison James and sociologist Alan Prout. This emergent paradigm adheres to an intention of coming close to children's own experiences of being a child by actively letting them take part in the research as interpretative individuals and break with the traditional developmental psychological descriptions of children (James and Prout, 2005; Kellett, 2014). In the thesis, I conceptualised my aim by incorporating two fundamental components of "the new child paradigm" (James and Prout, 2005: p. 9)

1) Children's social relationships and cultures are worth studying in their own right, independent of the perspective and concerns of adults, and

2) Children are and must be seen as active participants in the construction and determination of their own social lives, the lives of those around them and of the societies in which they live.

I found it particularly important to observe and listen to the children and explore their perceptions and experiences of their own daily recess world. Therefore, it was a deliberate choice not to include other groups of relevant people (e.g., parents, teachers and principals). It was also important to me that no teachers (or other adults) were present during my interviews with the children since an

existing power relation between the children and their teacher can be a barrier for the children's free speech (Carstensen et al., 2013). At one school it was difficult to convince a teacher that she should not take part in the interviews with the children. As a natural consequence of my understanding of children as independent individuals, I collected data together with the children using child participatory approaches such as participatory photo interviews and go-along group interviews (these methods are further described in the method section, page 30-34). Child participatory approaches are found to be valuable to capture children's perceptions and experiences of PA (MacDougall et al., 2004; Clark and P, 2011; Darbyshire et al., 2005).

3.3.1 An atypical adult - my role as a researcher

Research work that builds on participatory approaches was found to reduce misinterpretation (Hurworth, 2003). However, this does not guarantee that the full perspective of the children was correctly understood as the children's interpretations were deduced by my analytical constructions and theoretical considerations (Gulløv and Højlund, 2006). Related to this, there is a risk that I might have taken some of the children's perspectives for granted because they might have appeared common to me by virtue of, for example, my "membership" of the Danish society or my professionalism as a health researcher (de Jong et al., 2013). To reduce misconstructions during the whole research process, I consciously tried to contain my pre-understanding by trying to be open to what I found. During my data collection I was particular aware that my role as a researcher, coming from outside the explored social recess world, was to decompose traditional realisations and not to acknowledge social phenomena as "natural". This position paved the way for finding that the social world could be different from what I expected (Wenneberg, 2002), as demonstrated in the field note excerpt below.

Peter from class 5B is a very obese boy who against my expectations is objectively measured to be in the group of high physically active children. It really surprises me and I believe it is a measurement error. During my first recess observation I expect to find him in the classroom playing on the computer. However, contrary to my expectations I find him at the soccer field playing a key role in the boys' soccer play. It thrilled me but it also motivates me to follow Peter to see if it was a coincidence that he played soccer that day. It takes me many observation days to acknowledge that Peter is highly physically active during recess (field note excerpt Study 3).

As an adult researcher it is also important to be aware that your presence cannot pass unnoticed (Fine and Sandstrom, 1988). Acceptance into the world of children is highly challenging because of obvious differences between adults and children in terms of cognitive and communicative maturity, power, and physical size (Eder and Corsaro, 1999). This prevents having a fully participating role in the children's life (Mandell, 1988). The position I aimed for during my observation work is best explained by what Spradley calls "moderate participation" (Spradley, 1980) or what Corsaro calls "semi-participation" (Corsaro, 1996). I wanted to disturb the children's actions and interactions as little as possible even though my presence in the field might have affected the children's behaviour. I did not take initiatives directed at the children during observations such as starting a play or mediating in a conflict. However, I was aware of not being too passive. I followed the children and hung out with them during recess. This position allowed for a good combination of involvement and detachment necessary to remain at a distance from the children (DeWalt et al., 1998). These modest interactions with the children made me become what Corsaro calls an "atypical adult"; not a child and not a "real" adult (Corsaro, 1996). I clearly experienced that I was an "atypical adult", for example, when I during the first day of my third study entered the classroom, as illustrated below.

In class 5A the children are sitting at desks in long rows. In one of the rows I spot an empty space and ask the boy next to the empty chair [William] if I could sit there. He looks at me saying: "Adults don't sit on these chairs" while he generously pulls out the chair for me (field note excerpt Study 3).

Corsaro argues that an "atypical adult" can gain access to parts of children's knowledge that "real" adults cannot (Corsaro, 1996). Similarly to Corsaro, I found, that reducing my authority role as an adult by sitting next to the children during lessons and participating in the children's recess activities provided the chance to gain insight in the unknown recess culture and gave me more authentic data (Woodward, 2008; Eder and Corsaro, 1999). For example, by sitting next to William a few days I experienced that a group of girls repeatedly sought my presence just after lessons by coming over to my desk initiating talks. After a couple of days we were talking about girl-stuff such as popular clothing, pets, and boyfriends while braiding hair. I experienced that adopting this researcher position meant that the children relatively fast did not seek my reactions which, according to Corsaro, would had been different if I had positioned myself as a "real" adult (Corsaro, 1996).

4. Methods

A qualitative approach informed by a constructionist paradigm became my method of choice for gaining an in-depth understanding of children's perceptions and experiences of factors influencing their PA behavior during recess. This approach allows children to have a more direct voice in the creation of data (James and Prout, 2005; Darbyshire et al., 2005). The overall purpose of this method section is to create transparency in my qualitative research process. I have outlined my methodical choices and considerations in relation to the research context, population, data collection procedures, analysis, and ethics.

4.1 Research setting and population

This thesis pertains to the Danish primary school attended by children aged 6-16 years. Danish schools are typically organised in three tiers: junior (grade 0-3, 6-10 years old), middle (grade 4-6, 10-13 years old) and senior (grade 7-10, 13-16 years old). The target group of this thesis consisted of the middle tier students (grade 4-6; 10-13 years-old) in order to get a better understanding of PA behaviour among an age group known to significantly decrease their PA (Nader et al., 2008; Dumith et al., 2011).

During the three years of the study, a new school reform was implemented in August 2014 (between Study 2 and Study 3), leading to longer school days and more time allocated to PA. According to the new school reform children from grade 4-6 attend school for 33 hours each week (8 hours more per week than before the reform) and on average a minimum of 3.45 hours per week (45 minutes per day) should be allocated to PA (with 3 hours accounted for by PE each week). This is less than 1 hour more PA per week than before the reform (Ministry of Education, 2013). Approximately 1 hour is dedicated to recess per day, distributed over two to four breaks. In general, the lunch break is the longest break, lasting 25-30 minutes. Recess is typically characterised by teacher-monitored free play without any organised curriculum (Skole og Forældre, 2015).

4.1.1 The Activating Schoolyards Study - My Danish context

I gained access to the Danish school setting by being part of The Activating Schoolyards Study. The primary aim of The Activating Schoolyards Study was to physically change schoolyards to promote PA during recess, particularly focusing on the least physically active schoolchildren (see design paper, appendix I). As mentioned, the present thesis was linked to the intervention study by adding knowledge of factors influencing children's PA behaviour during recess to the initial developing

phase. All Danish schools included in the thesis were recruited from The Activating Schoolyards Study prior to the intervention. My connection to the intervention study facilitated co-operation with and access to the schools (e.g., principals, teachers, school secretary). In Study 1, I recruited all 17 schools included in the first phase of The Activating Schoolyards Study with the aim to explore similarities and differences across schools (Mason, 2002). The 17 schools represent a wide range of Danish schools varying in geographic location, school type, number of pupils and grade-levels, socioeconomic status, square meters of schoolyard per child, recess rules and number of play facilities. The characteristics of the included schools was described in *paper I*. In Study 3, I selected one of the 17 schools for further explorations. To understand a complex issue such as PA behaviour among different subgroups of children, in-depth case-study research is necessary (Flyvbjerg, 2006).

4.1.2 The Play Study - My context outside Denmark

Recess PA levels are significantly higher in the New Zealand school setting than in the Danish school setting (Nielsen et al., 2012; Nielsen et al., 2010). I wanted to gain insight in the New Zealand school setting to identify possible PA-promoting recess practices transferable to Danish schools. Access to undertake my research in the New Zealand school setting was also gained by partaking in a schoolyard intervention study, The Play Study. During my five-month study visit to the Human Potential Centre, Auckland University of Technology in New Zealand, I became involved in The Play Study as a research assistant helping with the data collection. The aim of The Play Study was to increase PA and reduce weight gain in school children by expanding the number of permanent schoolyard play facilities in primary schools. All five intervention schools from the Auckland area were invited to participate in my Study 2 and all five schools agreed to participate. The study was based on an ethnographic fieldwork approach, not focused on a particular group of children within the primary schools, but on the organisational conditions at the schools. The exploration was conducted after implementation of new play facilities, but because my focus was on organisational initiatives the interventions did not affect my study findings.

In New Zealand, most primary schools enrol students in grade 1-6 (5-12 years old), whereas few schools also include intermediate students at the same site (grade 7-8, 13-14 years old), which was the case in two of my five study schools. The children attend school approximately 30 hours per week, and a minimum of 60 minutes were dedicated to recess per day, distributed over two breaks: morning tea and lunch. Lunch break is the longest break, lasting mostly 45-60 minutes. Recess is characterised by a free choice of participating in organised sport activities or free play.

4.2 Data collection procedures

In the thesis, three qualitative methods were used and combined: participant observation, go-along group interview, and participatory photo interview. In this section I describe these three methods in overall terms and explain why they were used. A more detailed description of the methods used to collect and analyse data (including interview guides) can be found in the papers.

4.2.1 Participant observation

Participant observation was carried out in all three studies and used in *paper II-V*. It is a method with roots in traditional ethnographic research and it involves varying degrees of observation and participation in the study community's daily activities (Spradley, 1980). Participant observation was introduced into anthropology in the beginning of the twentieth century by among others Bronislaw Malinowski (Malinowski, 1913). The approach is considered a stable method in ethnographic studies and it is characterised by having an open, non-judgmental attitude to the unexpected in relation to what is observed (DeWalt et al., 1998).

In the current thesis, the aim was to explore children's daily recess activities, which makes recess my primary setting of interest. In exploring daily recess activities there will be behavioural patterns and bodily practise, which are difficult to describe or be aware of (Kawulich, 2005), explaining why I used participant observation in all three studies. In Study 3, the observations also took place during lessons to get a more complete picture of the children's whole school day practise.

There is not one correct procedure for conducting research using participant observation (Spradley, 1980; Kawulich, 2005). For the purposes of my thesis I will use the term "deep hanging out" to describe my observational practice while I was in the field. Anthropologist Clifford Geertz was one of the first to verbalise "deep hanging out" as a participant observation practice. He used "deep hanging out" to describe participant observation that was in-depth, reflexive and engaged, but did not involve extended periods of fieldwork (Geertz, 1998). "Deep hanging out" is a form of sensory ethnography. It is a combination of seeing, listening, feeling and being engaged in the field and not solely a visual act (Geertz, 1998). Broadening the concept of participant observation to include engaged listening and conversation led to a richer and deeper contextual understanding of the social and cultural recess environment (Woodward, 2008; Eder and Corsaro, 1999), as exemplified above (page 27) with the group of girls from class 5A coming over to my desk after lessons talking about girl-stuff.

In all three studies participant observations were conducted both prior to the interviews and after the interviews. Observations before the interviews were open-minded observations where I was observing everything, whereas the observations after the interviews were more focused and guided by the children's insights (Angrosino and Perez, 2000; Wolcott, 1994). The combination of open and more focused observations gave me the opportunity to first have an open-minded view towards the explored phenomenon and thereafter to focus my observations in relation to my purpose (Kawulich, 2005).

4.2.2 Go-along group interview

With an ambition to involve the children in the research process, go-along group interviews were conducted in Study 1 and 3 and the data were used in *paper I, II and IV*. The go-along method is a combination of an in-depth interview and observation conducted by researchers while participating in a tour guided by the informants around their "natural" location (Kusenbach, 2003). Through asking questions and observing, the researcher is able to explore the informants' perceptions, experiences, interpretations, and practices within this environment (Carpiano, 2009). One of the first to employ go-along interviews was urban planner Kevin Lynch in 1960 (Lynch, 1960). However, even though the method has great utility for studying interaction between humans and their environments, the method is not widely used, especially not among children (Carpiano, 2009).

In my thesis, children took me on a walking tour around their schoolyard and shared indoor areas. This go-along approach was chosen to gain knowledge about children's lived experiences of their explored social and physical environment during recess (Kusenbach, 2003). Children's interaction with their environment is characterised by bodily contact, e.g., by collecting something from the ground, touching elements in the environment etc., and this is difficult to explain with words, but it can be observed (Carstensen, 2006). Thus, I found that the go-along interview method had a great utility for exploring and subsequently improving my understanding of the children's perceptions and experiences of their recess context. During the guided tour many of the children physically interacted with the passing facilities and it was clear who had a natural relation to the specific facilities we passed, as shown in the field note excerpt below.

I went out in the schoolyard with three boys and one girl in front of me guiding me around. Another two girls walked next to me. When we passed a huge climbing frame two of the boys quickly climbed up a slide one by one while they in turns eagerly explained how they used the climbing frame to play tag. One boy grabbed a bar and was swinging from bar to

bar shouting: “*no one can catch me here*”. I had to act very quickly to follow the two boys with my iPad filming the interview (Field note excerpt, Study 1).

Another strength (also illustrated in the excerpt above), was that the method could help the children recall memories of their recess behaviour when moving around in their recess environment (Kusenbach, 2003). Since most children took the lead and served as tour guides, this method also provided an opportunity to increase the participation of children and influence the typical power dynamics that exists between the interviewer and interviewee in the children’s favour (Carpiano, 2009). I found this to be advantageous being an adult researcher conducting child research. Requesting the children to show me around seemed to increase motivation for participation and even create pride. This fits well with the reflection of Agar that most people enjoy telling their story to someone who is interested in listening (Agar, 1996).

The go-along method is described as a highly flexible method that can be tailored to the needs of particular research studies and different interviewing formats (Carpiano, 2009). The go-along interviews I conducted were semi-structured using both prepared and ad hoc questions. The prepared questions helped keeping focus at the explored environment. The ad hoc questions were posed to allow for further exploration of the children’s answers or acts in the environment.

I conducted the go-along interviews in groups of children during lessons. The participating children were purposely sampled with help from the school principal or a designated teacher who knew the children and could recruit children with diverse characteristics to ensure variation in gender, social backgrounds and PA levels to allow for contrasting opinions (Morgan, 1997; Krueger and Casey, 2002). Although it probably would have been more natural to conduct the go-along interviews during recess, they took place during lessons to keep the participating children focused during interview. I found conducting go-along interviews in smaller groups very productive as the group interview could demonstrate child to child interaction in the explored environment, as demonstrated in the above quote. Another advantage, also reported by Kusenbach, was that the presence of schoolmates made me as a researcher less visible and could reduce the discomfort that some of the children might have felt about being followed in, and queried about, their recess practices (Kusenbach, 2003).

4.2.3 Participatory photo interview

Participatory photo interviews were conducted in Study 3 and used in *paper V* to gain in-depth insight into the least physically active children’s lived experiences of recess PA.

A photo interview (also called photo elicitation) is an approach where photographs are used in an interview context (Harper, 2002). Photo interviews in various forms have been employed since anthropologist John Collier introduced them in 1957 as a valid and useful method for collecting data (Collier, 1957). The method has been used successfully in different cultural studies among children (Hurworth, 2003), and has, in particular, come to play a key role in various ecological studies of child-environment relationships (Jorgenson and Sullivan, 2010; Rasmussen, 2004). This method is therefore well suited to be used in my thesis exploring children's perceptions and experiences of recess PA in the school setting.

I used a participatory photo interview approach asking the participating children to take photos of their recess activities to stimulate dialogue between the children and me as a researcher (Clark, 1999; Miller, 2014). This interview approach reduced my authority as an adult researcher in line with the new paradigm of childhood (James and Prout, 2005; Rasmussen, 1999). The photos had a dual purpose. I used the photos as a tool to help guide the interview and to facilitate clarifying questions. The children could use the photos to trigger their memories and provide nuanced dimensions of their recess experiences (Clark-Ibanez, 2004; Miller, 2014; Darbyshire et al., 2005).

The images taken might not always contain new information but could trigger meaning for me as a researcher. The method empowered the children to tell me about aspects of their social recess world including everyday processes and events that potentially could have remained dormant or taken for granted, from an adult point of view (Clark-Ibanez, 2004; Jorgenson and Sullivan, 2010). As exemplified below, a photo could help the children to express their social recess life and strengthened my understanding of the children's social recess world.

Karen shows me her three photos. Particular a photo of an empty armchair attracts my attention. Karen tells me that it is her favourite place during recess but I do not get more information about the photo. Karen seems to be verbally challenged and I have to coax words out of her. It makes me feel lucky that we had the photos to talk about. After the interview, Karen and the armchair belong together in my mind. I started to pay attention to the armchair, often finding Karen sitting there alone observing other children's play through the window behind the armchair. I ask myself if the photo was Karen's way of telling me that she felt lonely during recess? (Field not excerpt, Study 3).

The challenges described by using the participatory photo interview approach are often logistical e.g., camera supplies and forwarding of photos prior the interview calling for support (Jorgenson and

Sullivan, 2010), for example from the schools. In the current study, I collaborated closely with the class teachers and the continuous technological developments helped minimise our logistical challenges. All children except one used their own smartphone with internal camera and the child without a mobile phone borrowed a friend's mobile phone. They sent the photos to their teacher, and the teacher collected all photos and e-mailed them to me.

4.3 Analysis

To ensure consistency, I transcribed all interviews verbatim myself and made field notes during each of the data collections. After collecting the data I manually coded the data.

Thematic analysis was the primary analysis procedure I used to code the data. I used thematic analyses to find themes (factors) and determine how these themes were present in the data material. Thematic analysis is a common form of analysis in qualitative research. It emphasises identifying patterns within data (Neergaard et al., 2009; Sandelowski, 2000; Braun and Clarke, 2006). The thematic analysis procedure is related to the phenomenology underlining the children's perceptions, feelings and experiences (Guest, 2012). Thematic analyses were performed through a process of coding in six phases to create established, meaningful patterns, which I went through during all analyses (Braun and Clarke, 2006). These six phases were: familiarisation with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and finally producing the five papers. I realised all six phases were dynamical and had fluent transitions and sometimes I was analysing in multiple phases at the same time. For example, I found it difficult not to start generating initial codes when I read through my transcripts for the first time getting familiar with my data.

A thematic analysis process can be inductive or deductive (Braun and Clarke, 2006). In my data analysing processes I was both inspired by inductive and deductive approaches. In line with the hermeneutic phenomenological methodology I tried to be open to what the material said during the analysis process by letting the children's statements speak for themselves (Van Manen, 1990; Annells, 1996). However, I was also theoretically inspired and used theory to structure some of my data analyses leading to less descriptive analyses as the analysis is limited to the preconceived theoretical frames (Crabtree, 1999). For example, in Study 1 I used a socio-ecological model to focus my research of barriers to recess PA, resulting in a deductive analysis in *paper I*. However, during my analysis I found that the data material also contained gendered and relational aspects associated with recess PA. These aspects needed a more open analysis where the assumptions were data-driven

and the themes identified were strongly linked to the data (Boyatzis, 1998), resulting in an inductive analysis in *paper II*. It is important to note that throughout this inductive process, it was not possible for me as a researcher to free myself from the theoretical epistemological responsibilities.

4.4 Ethical considerations

Ethical considerations should be highly prioritised in conducting research with human subjects and especially children (Santelli et al., 2003). Ethnographically inspired child research is a relatively new scientific tradition. One of the first to formulate ethical guidelines in this research field was the social science researcher Priscilla Alderson (Gulløv and Højlund, 2006). Consistent with the new child paradigm she stressed that children's position and possibilities are taken into account prior the data collection so that participation places a child at no more than negligible risk of harm (Alderson, 1995). Particular the third data collection where I explored subgroups of children, here among the least physical active children, was precluded by thorough ethical considerations to avoid stigmatisation of children. For that reason, I planned a meeting with the class teachers prior to my data collection and together with them I considered the ethics of the data collection procedure. For example, talking to the class teachers convinced me to also recruit more physically active children to participate in the study in order not to stigmatise the least physically active children that were the main focus of the study.

Priscilla Alderson, among others, further stated that the children have to give consent prior the data collection, or consent has to be given on their behalf by a parent or guardian, and that the children should have the possibility to withdraw from the study at any time (Santelli et al., 2003; Alderson, 1995). Prior to my data collections all school principals from the recruited schools approved of the respective studies. I then informed the children together with the class teachers about the purpose of the respective study since it is important to ensure that the children understand both their own and the researcher's role during the data collection (Sandseter and Seland, 2015). The teachers handed out informed consents forms for the parents of the invited children to complete (see an example of an active informed consent, appendix II). Key information provided to the parents and the children was that the participating children could withdraw from the respective study at any time, that the data were collected for specific scientific purposes, and that the children were depersonalised. In the papers the included schools were indicated with a number only and all children quoted in the papers were given pseudonyms. In *paper V*, where children featured in photographic material the parents provided an additional written consent specifically allowing further use of the photos taken by their

children as part of research material and for dissemination and publication. Data were collected in accordance with the Helsinki declaration, and the type of consent procedures used in this thesis have been found to be ethically appropriate for low-risk research in children of the age group enrolled in our study (Santelli et al., 2003).

Another important issue with regards to ethics is how to establish trust between child and researcher and what to do if a child disclosed that he or she was at risk of harm (Alderson, 1995; Morrow and Richards, 1996) All interviews were conducted as a confidential conversation between the children and me, of which I informed the children at the beginning of each interview. However, a-priory I decided that if a child would disclose that he or she was at risk of harm, I would tell the child that I had to pass this information on to a professional (e.g., a teacher) who could protect the child. I did not stop the confidential conversation with any of the children but in one case, after the interview with Karen mentioned above (page 33), I found myself in a very difficult ethical dilemma. I was worried about Karen's well-being at the school but decided not to pass this information to her class teacher. I assumed that I did not have more knowledge than her teacher and decided to continue the confidential relationship with Karen. I am still unsure if I made the right decision.

Finally, according to the Danish National Committee on Health Research Ethics, formal ethical approval was not required as the project was not a biomedical research project. The data-management procedures used in the Danish papers (*paper I, II, IV and V*) were approved by the Danish Data Protection Agency (2013-41-1900). The data collection procedure used in New Zealand (*paper III*) was approved by Auckland University of Technology Ethics Committee (AUTEK: 10/95).

5. Findings across papers

In the following section the main findings across the five papers are presented with the purpose of describing how each of the papers has contributed to answer my overall aim: *to gain knowledge on children's perceptions and experiences of factors influencing their PA behaviour during recess*. Across the papers I found multiple factors influencing the children's recess PA making the socio-ecological model an obvious choice to help structure my findings. The result section is divided in the children's perceived and experienced 1) individual factors, 2) social and cultural factors, 3) built environmental factors, 4) factors at the school policy level and 5) natural environmental factors. For a more detailed description of the results, including tables and figures see *paper I-V*.

5.1 Individual factors

5.1.1 Bodily self-esteem and ability

"I often have a headache and I am nauseous or something like that. Then I can only sit or lay down" (William, an 11-year-old overweight boy categorised into the group of least physically active children, paper V).

In *paper II*, a group of boys were called "the nerds". The other children categorised these boys as "not sporty", which made them have a low bodily self-esteem. In *paper V*, some of the least physically active overweight girls also had low bodily self-esteem. They disliked their body and wanted to lose weight. Feelings of bodily dislike seemed to make these children choose recess activities not requiring bodily skills, such as playing computer games, reading books, painting, listening to music and hanging out talking. Some of the overweight children also expressed a feeling of being out-of-breath when using their body physically, or they explained that they were physically inactive because of bodily pain. In contrast, the most physically active children clearly expressed that they mastered bodily skills.

In *paper V*, bodily tiredness was another explanation the least physically active children gave for not being physically active during recess. In line with this, some of the least physically active children were feeling mentally tired after lessons and needed to clear their head during recess by "*relaxing*". Their body experience differed from that of most of the physically active children who described a feeling of being "*hyper*"; an internal unrest in their body during lessons that had to be relieved by PA during recess.

5.1.2 Gender

“Soccer and such team sports are typical boy sports. Boys often do sport. Some girls also do horse riding, knitting and choir, where you are not moving, you see. Not many boys want to do that” (Emma, 10-year-old, paper II).

In *paper IV*, I clearly found that recess PA behaviour differed between boys and girls. Two-thirds of the children categorised in the paper as the Low PA children were girls involved in sedentary socialising activities in the classroom. Boys dominated the High PA group and spent most of their time on the field playing soccer.

In *paper II*, it became obvious that the children were prejudiced in their play, reinforcing gender binarism. They labelled play as either “*girls’ play*” or “*boys’ play*” depending on to what extent the play demanded bodily competences. Typically, “*boys’ play*” was defined by sport activities that demanded strength and fastness, while “*girls’ play*” was characterized by less physical demanding activities, often sedentary activities. However, some of the girls resisted gendered play and threw themselves into games and spaces dominated by boys. Nonetheless, some girls expressed frustration when they participated in activities with boys because they felt that they were bodily disadvantaged and could not physically match the more skilled, faster and stronger boys.

5.2 Social/cultural environmental factors

5.2.1 Gendered school culture

“It’s almost like a soccer camp for boys” (Oscar, 11-year-old, paper II).

Although the children created their own social world in the schoolyard, both in the Danish context, *paper II*, and in the New Zealand context, *paper III*, the teachers actively shaped and reinforced gender roles during recess through their action or inaction. Male and female teachers were observed to act differently when it was their duty to monitor recess. Male teachers were mostly seen at the soccer field or in other ball game areas, whereas female teachers spent more time at the playground or near the school entrances talking to other teachers or the girl groups who were hanging out there. It occurred, mostly at the New Zealand schools, that a monitoring teacher interacted in a play but when it happened it was typically a male teacher joining a ball game.

In *paper II*, the children also experienced their physical schoolyard as gendered. Soccer fields were the dominant play facility at most schools and they favored the boys’ play. At many schools children

even expressed that soccer was one of the only things to do during recess, reducing the girls' play opportunities.

5.2.2 Peer influence

“Just because my friends do” (10-year-old Tom answering my question on why he plays computer games despite preferring to play soccer, paper I).

In *paper I*, some children reported that they were playing computer games during recess because their friends did, even though they would rather play ballgames. Similar, the children in *paper V* believed that their friends contributed to their enjoyment of activities. When the children were asked why they participated in activities the most common responses were *“because my friends do”* and *“I like being together with my friends”*. Many of the children expressed that they felt a strong bond to friendships that had started prior to their school attendance and that these existing friendships seemed to influence their recess behaviour. I both found low physically active children being encouraged by friends to be physically active during recess and high physically active children preferring sedentary recess activities because their friends did so.

5.2.3 Conflicts and exclusion

“It's easier being a boy if you like playing soccer” (Simon, 11-year-old, paper II).

In *paper I*, boys, in particular, experienced conflicts when playing soccer or other ballgames. The reason for such conflicts was often caused by the importance placed on winning. Many of the boys took the ballgame so seriously that team constitution and rules of play often caused disagreement. In *paper V*, one of the least physically active boys explicitly explained that he remained indoors during recess because he wanted to avoid the conflicts between the soccer-playing boys. In line with this, it became clear from the interviews in *paper IV* that many of the children playing foursquare chose this over playing soccer because they found soccer too serious, too competitive, and often too conflict-ridden.

In *paper II*, a power hierarchy seemed to structure the children's recess play. In this paper it was the boys who controlled and dominated the majority of activities during recess and laid the foundation for children's (non) participation in PA. Similar, in *paper I* and *paper IV*, many girls wanted to play soccer but felt that they were not allowed to join the boys' ballgames or if they were allowed, they experienced that the boys did not include them (e.g., by not passing the ball to them). In *paper II*, I

also found that the boys displayed a clear hierarchical division among themselves by calling the boys who were less skilled at participating in sport games “the nerds”. In contrast, boys who were skilful soccer players carved out and reinforced through their behaviour that they were the “cool” boys and the other boys looked up to them. Because of this hegemonic boy hierarchy, the boys who were not sporty felt like outsiders.

A power hierarchy related to age was also found among the boys. In *paper IV*, a grade hierarchy was observed in the fight for getting the most attractive soccer fields, often causing conflicts. In *paper I*, boys also told me that they felt dominated by older boys who “wrecked” their play by taking their equipment (e.g., balls), facilities (e.g., soccer field) or disrupting games (e.g., throwing snowballs). This both ruined their play and started conflicts, which they felt were time consuming and time wasting.

5.3 Built environmental factors

5.3.1 Space and place experiences

“It’s a cosy place [the classroom], and it’s where you belong [...]. You know the place and you can do what you want to do in that place without being disturbed or others being irritated by you (Julie, a 12-year-old girl categorised into the group of least physically active, paper V).

In *paper I*, children reported feeling “crowded” in the schoolyard at schools with small outdoor areas. Recess PA was complicated as many children were doing different activities in the same area at the same time. Because of overcrowding and excessive noise in the small schoolyards particular girls mentioned that they often sought out small secluded areas where they could stay in smaller groups. However, the fact that girls sought out small secluded spaces seemed not only to be related to a small schoolyard. Even at schools with plenty of space per child, many girls were still attracted to smaller secluded areas. My findings in *paper IV* and *paper V* support this. In these papers most of the indoors-staying girls were socialising with their classmates in smaller secluded indoors areas. The girls perceived these smaller areas as cosy and relaxing places where they could talk about girl-stuff or read a book undisturbed.

In *paper V*, particular the classroom was perceived as a pleasant place during recess among some of the least physically active children. These children expressed a strong affiliation with the classroom calling it “*our*” room. They explained that special norms and codes of behaviour were connected to

the room making it a safe place to stay. It was important to them that they could close the door and not be interrupted by children from other classes. In contrast, most of the high physically active children in *paper V* were at the field playing soccer, and did not express an innate affiliation with the classroom.

5.3.2 Lack of play facilities

“We just sit indoors talking [...]. Well, there is not really anything to do during recess and if we go outdoors you can only play soccer” (Maya, 12-year-old, paper IV).

In *paper I*, lack of schoolyard facilities was identified as the main barrier to recess PA. Because of the perceived lack of facilities many children preferred to stay in the classroom during recess. Based on the interviews in *paper IV* and *paper V*, some of the children staying indoors expressed that they stayed indoors because they felt a lack of motivating outdoor play facilities.

In *paper I*, perceived lack of recess facilities resulted in very different behaviour for boys and girls, respectively. If the boys did not get the facilities they wanted, they were often very creative in playing something else or using alternative facilities (e.g. benches were used as soccer goals, door sills and stairs as ramps for skateboards and scooters, and playhouse roofs as parkour facility). In contrast, girls engaged in more passive activities when the facilities they wanted to use were occupied. Similar to this “waiting” was a frequent activity observed in the schoolyard particularly among the girls in *paper IV*.

5.4 School policy factors

5.4.1 Outdoor play policy

“It’s irritating not to decide yourself, but if we had a nice schoolyard I would actually decide to play outside” (Alex, 11-year-old, paper IV).

In four out of five New Zealand schools, in *paper III*, children were required to be outside during recess all year round. When asking the children if they would rather stay indoors during recess, most children preferred to stay outdoors because there were more things to do outside. In contrast to the New Zealand schools children at many Danish schools in *paper I* could decide themselves whether they wanted to stay indoors or outdoors during recess. However, similar to the New Zealand children in *paper III*, many Danish children expressed in *paper IV* that if there were many different play facilities in the schoolyard, they would prefer to do activities outdoors during recess.

5.4.2 Use of electronic devices

“It [the mobile phone] attracts us like a magnet” (Victor, 10-year-old, paper I).

At 16 out of 17 Danish schools in *paper I* the children were allowed to use electronic devices such as smartphones and tablets during recess, and almost every child in the fourth grades classes studied brought a smartphone or tablet to school on a daily basis. Many of the children stated that their smartphone or tablet was tempting to use during recess and they experienced those electronic devices acted as a barrier to recess PA. To increase recess PA many children suggested that the school should provide restrictions on using electronic devices.

Oppositely, at four out of five New Zealand schools in *paper III* electronic devices were not permitted during recess. The arguments for not allowing electronic devices at the New Zealand schools were reduction of recess PA and the anti-social culture they induced. At one New Zealand school the children were allowed to use their own electronic devices during recess. However, very few children used electronic devices at this school because their parents did not allow them to bring their electronic devices to school or because they simply did not have their own electronic devices.

5.4.3 Recess duration

“When I feel bored time is going so slow but together with my friends time goes fast”
(Albert, an 11-year-old boy categorised into the group of least physically active, paper V).

In *paper III*, three of the five New Zealand schools had a lunch break lasting 50 to 60 minutes which was approximately twice as long as the Danish lunch breaks reported in *paper I*. The longer recess duration in the New Zealand schools potentially doubled the time for recess PA. Moreover, it enabled starting up PA promoting activities such as organised sports or opening up alternative facilities for free play such as the sports hall and swimming pool. Oppositely, in *paper IV*, children at the Danish school studied expressed that their ten minutes afternoon break was too short to get to the field and start up a soccer game.

Even though recess has a quantifiable duration, the children’s subjective perceptions of time were found to differ in *paper V*. Generally, recess was experienced as a period where time went fast because they *“had fun”* or *“had a good time”*. Some children wanted to utilise the *“fast going”* recess period optimally. Particularly the high physically active children who played soccer used the time prior to recess to plan their activity to get the full potential out of the recess period. Some of the

least physically active children in the study were sitting passively observing other children's play. These children expressed that recess sometimes felt long. Explanations for this perceived elongated recess were "*feeling bored*" or "*having a bad day*", which anchored them in objective time by constantly looking at a clock.

5.4.4 Organised activities

"Fun game is going on if you wanna come" (a teacher organising recess sport activities speaking to a boy in the schoolyard, paper III).

In *paper III*, it was common for the New Zealand children to have the opportunity to participate in organised sports during recess such as netball, softball, rugby, cricket, cheerleading and soccer. At some schools children enrolled in a sport at the beginning of the school year and they practiced several times a week during recess and participated in tournaments during the weekends. At other schools children could participate in different organised sport activities from day-to-day. The organised sports during recess were offered to create equal possibilities to attend sport activities among children, and especially helped children that were not very skilled in self-organising play for longer periods of time. This viewpoint was also found among children in *paper I*. In this paper the children, mainly girls, thought it would reduce conflicts and create more play across genders and age groups if teachers were involved as play initiators, creating teams or acting as referees.

In *paper III*, it was also common that older New Zealand students had recess duties. The children experienced that different duties, such as a peer mediator duty and a duty to lend out play equipment, helped initiate play. All duty students took their responsibilities seriously and the system seemed to work well with help from a coordinating teacher.

5.5 Natural environmental factors

5.5.1 Weather

"We like it when it's a bit warm because then it's much more fun to be outside because you can do more. When it's cold or rainy then you really don't want to do so much" (Camilla, 11-year-old, paper I).

In *paper I*, bad weather conditions seemed to be one of the main barriers for recess PA. Many children, particular girls, did not think it was fun to play outside in rainy or snowy weather. They preferred to stay indoors doing sedentary activities. Additionally, at some schools the children were

not allowed to use some specific outdoor areas during rainy weather in order to prevent dirt being brought indoors.

5.6 Summary of findings

In all, twelve different factors perceived to influence recess PA were identified across the layers in the socio-ecological model: two individual factors (bodily self-esteem and ability, and gender), three social/cultural environmental factors (gendered school culture, peer influence, and conflicts and exclusion), two built environmental factors (space and place experiences, and lack of play facilities), four school policy factors (outdoor play policy, use of electronic devices, recess duration, and organised activities), and one natural environmental factor (weather).

6. Discussion

This section contains two parts. Firstly, the main findings are discussed and compared with findings from previous research in the field of recess PA and in relation to the socio-ecological model.

Secondly, I will address and discuss strengths and limitations of my research.

6.1 Main findings in relation to previous research in the field

This thesis set out to contribute to the current literature on children's recess PA by exploring children's perceptions and experiences of factors influencing their PA behaviour during recess. The twelve different factors I found to be influencing the children's recess PA are discussed below in the light of previous findings in the field.

6.1.1 Discussion on individual factors

Bodily perceptions seem to be related to PA. The group of boys called "the nerds" were feeling unfit or bodily non-skilful, which made them refrain from PA. The masculine ideal of being muscular tends to imprint to boys from a young age with what it means to be a man (Papadopoulos, 2013). For boys not conforming to these ideals, a lack of self-esteem can be a consequence (Kehler and Atkinson, 2010; Hargreaves and Tiggemann, 2006). Similarly many of the least physically active children felt bodily dissatisfaction. Body-related barriers to PA among adolescents, such as dissatisfaction with body image and lack of competences, were also found in other studies (Stankov et al., 2012; Zabinski et al., 2003). In two studies there seemed to be a link between lack of fundamental movement skills in children and their non-interest in engaging in recess PA (Parrish et al., 2012; Blatchford and Sharp, 1994). I also found that bodily complaints among the overweight children seemed to influence their relation to PA negatively. In a review by Stankov et al., fatigue and physical discomfort were shown as barriers for being physically active among overweight adolescents (Stankov et al., 2012). Some children also complained about bad sleep habits that were demotivating them from engaging in recess PA. Other studies on children have also showed associations between inadequate sleep and increased sedentary time (McNeil et al., 2015) as well as increased physical inactivity (Singh et al., 2008).

Boys were observed to be more physically active than girls, confirming that gender is an individual factor that influences recess PA. This is similar to other qualitative studies observing a gender difference in recess PA (Schmidt, 2009; Blatchford, 1996; Blatchford et al., 2003; Boyle et al., 2003;

Thorne, 1993). Likewise, a review including quantitative studies found boys to be significantly more physically active than girls (Ridgers et al., 2012). Nielsen et al. showed that the largest gender difference in children's overall PA was apparent during self-organised PA such as recess. They explained the gender difference by boys being more interested in playing soccer as a self-organised activity than girls (Nielsen et al., 2011). Similarly, I found opposing activity patterns for boys and girls. The majority of boys spent time outdoors during recess engaging in physically active games, particularly soccer. For many girls, recess activities equaled socialising by hanging out. In one study by Fjørtoft et al., no gender difference was found (Fjørtoft et al., 2010). However, this was a small study only conducted during lunch breaks at two schools revealing relatively low levels of recess PA in both boys and girls.

6.1.2 Discussion on social and cultural environmental factors

The school culture was found to play an important role in contributing to the traditional dichotomy between boys and girls. Similarly, Swain described school culture as two complementary gendered cultures sharing one school world (Swain, 2005). Several other studies have pictured the schoolyard as a place that is segregated in terms of gender (Thorne, 1993; Rönnlund, 2015; Epstein et al., 2001). This is in line with the geographer Massey explaining that places and spaces are gendered (Massey, 1994). I observed that many monitoring teachers performed according to a traditional gender role during recess, reinforcing stereotypes. Likewise, PE studies and other school studies indicated that the attitudes and actions of teachers reflected gender stereotyping (Sargent, 2013; Smith, 2007; Stidder, 2002; Larsson et al., 2009; Reay, 2001; Waddington et al., 1998). Sargent found that male teachers were under cultural pressure to perform as 'male role models' for the boys, demonstrating masculinity to boys and instilling hegemonic norms of masculinity (Sargent, 2013). However, some boys preferred gender mixed play and were observed playing gender mixed in a part of the schoolyard with playground markings. Similar, Rönnlund found that places such as wooded areas without predefined activities invited the children to play more freely and gender mixed (Rönnlund, 2015).

In my studies the social recess environment seemed to be very important, in line with Blatchford et al., who showed that recess first and foremost was a social event (Blatchford et al., 2003). As part of this, I found that peer influence was a factor that could both be a facilitator and a barrier to recess PA. I both found low physically active children being encouraged by friends to be physically active during recess and high physically active children preferring sedentary recess activities because their

friends did so. In another qualitative study exploring facilitators and barriers of lunchtime PA peer influence was also both positively and negatively associated with PA (Stanley et al., 2012).

As a result of a clear power hierarchy during recess some children experienced a poor social recess environment, which affected their PA negatively. Especially competitive sports-minded boys were involved in conflicts, which they perceived as time consuming. In another study conflicts were time consuming in PE lessons, suggesting that up to one quarter of lesson time was taken up by conflicts related to organisation of teams, activities and game rules (McKenzie et al., 1997). Two studies showed that increased teacher supervision could lead to faster conflict resolution and lead to increased PA, particularly among boys (Willenberg et al., 2010; Sallis et al., 2001). Exclusion from play was another social factor related to the existing power hierarchy found to reduce recess PA. In particular girls and the group of boys called “the nerds” perceived themselves as bodily unskilled and they felt excluded from ball games such as soccer. In a study by Thorne she described that girls could only reach “with-then-apart” status in the boys’ soccer world (Thorne, 1993). However, the few skilled “soccer girls” did not seem to be “with-then-apart” in the boys’ world. Similar to a study by Swain, these girls felt respected by the boys (Swain, 2005), probably because they were identified with masculinity (Holland and Harpin, 2013; Paechter, 2010). Soccer abilities have been shown to act as a key factor in constructing hegemonic masculinities in schools and represent a prestige resource in signifying successful masculinity (Connell and Messerschmidt, 2005; Swain, 2000; Swain, 2003; Smith, 2007) These findings were echoed strongly in my study where a hierarchy in recess play among boys and girls, but also internally among boys, was present and resulted in conflicts and exclusion.

6.1.3 Discussion on built environmental factors

Lack of space was experienced as an important factor influencing recess PA, which was similar to other qualitative studies (Stanley et al., 2012; Ozdemir and Yilmaz, 2008). This is also supported by findings from quantitative studies where more play space per child was positively associated with more recess PA (Cardon et al., 2008; Delidou et al., 2015; Ridgers et al., 2010). Conversely, Sallis et al. found that the play area size was not significantly associated with recess PA (Sallis et al., 2001). However, their study assessed available space in different schoolyards rather than the space available per child. Moreover, related to space, my findings indicate that girls are attracted to smaller secluded indoors areas, which are spaces associated with less PA than outdoor spaces (Dessing et al., 2013; Fairclough et al., 2012). In another study almost half of the 175 children included in the study, mostly girls, wanted the option of staying indoors (Mooney et al., 1991). I found that some girls categorised

in the group of least physically active preferred remaining in the classroom during recess because of “classroom safety” and “indoor cosiness”. According to Van Manen, children want to feel comfortable or intimate in a space (Van Manen, 1990). It seemed as if the classroom was the secure inner sanctuary where these children felt protected. A place where they could be themselves without being confronted with how good or bad they were at performing certain things (Bollnow, 1960). In contrast, a study by Darmody et al. found that most children identified the schoolyard as their “favourite” place associated with fun and relaxing (Darmody et al., 2010). However, this study did not investigate experiences among different subgroups of children.

Lack of play facilities also seemed to be a key factor for recess PA. Some of the low physically active children explained that they stayed indoors during recess because of an experienced lack of outdoor play facilities. Moreover, some of the children playing outdoors told me that the limited number of play facilities in relation to the number of children wanting to use the facilities caused waiting time, and was a restricting factor for PA. The experienced lack of play facilities during recess is similar to experiences in previous qualitative studies (Stanley et al., 2012; Parrish et al., 2012; Thompson et al., 2001) and is supported by a review finding a positive association between recess PA and overall facility provision as well as the provision of unfixed equipment (Ridgers et al., 2012). Also, Zask et al. reported that the ratio of balls to children was related to vigorous physical activity (VPA) (Zask et al., 2001). Recently, a study by Delidou et al. also showed a positive association between PA and recess equipment (Delidou et al., 2015). Other studies have found that the number of school ground play facilities was associated with the daily amount of PA (Nielsen et al., 2012; Nielsen et al., 2010; Taylor et al., 2011).

6.1.4 Discussion on school policy factors

Higher PA levels were observed outdoors than indoors during recess. However, only few of the studied schools had a recess policy supporting outdoor play. The children in most schools studied decided themselves if they wanted to stay indoors or outdoors during recess and many children decided to stay indoors. Other studies have also found that use of outdoor school environments facilitates play and is associated with increased levels of recess PA (Wood et al., 2014; Ridgers et al., 2011; Dessing et al., 2013; Fairclough et al., 2012). Furthermore, a review revealed an overall positive effect of outdoor time on PA, sedentary behavior, and cardiorespiratory fitness (Gray et al., 2015). To support outdoor recess play most of the New Zealand schools had a ‘stay outdoors’ recess policy. In a Danish intervention study an outdoor policy for 6-8 graders was implemented. At first, the students’ responses were mostly negative, resulting in conflicts between duty teachers and

students trying to hide indoors. However, the resistance was reduced in the second year of the intervention (Troelsen et al., 2014).

Electronic devices (smartphones and tablets) were allowed during recess and widely used at the studied Danish schools. The use of these electronic devices during recess was experienced as a barrier to PA in such degree that the children suggested restrictions. Not many studies support my finding, probably due to the fact that children's use of electronic devices during recess is a relatively new phenomenon, or because the phenomenon is specific to a Scandinavian context. Most of the New Zealand schools studied had a recess policy not allowing use of electronic devices, and another Scandinavian study supports that using electronic devices during recess is a new phenomenon. They described that the frequency of smartphone use among fifth-grade pupils in Sweden grew from 3 to 53% between 2010 and 2013 (Raustorp et al., 2015). This study also found that use of smartphones led to greater physical inactivity during recess, particular among boys (Raustorp et al., 2015).

Longer recess duration seemed to prolong time spent in PA during recess. Similarly, other studies have shown that the longer the recess duration, the more children engaged in PA (Ridgers et al., 2007; Parrish et al., 2012). However, it was the high physically active children who seemed to utilise the whole recess duration being physically active, implying that lengthening recess might not change PA behaviour among the least active children. A longer recess duration could enable starting up PA promoting activities such as organised sports or opening up alternative PA facilities benefitting other children than the high physically active children. I have not found other studies exploring the relation between recess duration and PA among different subgroups of children.

It became clear that recess in New Zealand schools is much more adult-regulated with organised recess activities, compared to Danish schools. In Danish schools, a long pedagogical tradition has given preference to children's free play and self-directed activities (Skole og Forældre, 2015; Ministry of Education, 1960). However, in a study by Huberty et al., having trained teachers initiating recess activities increased MVPA, especially in overweight children (Huberty et al., 2011). In the Danish intervention study mentioned above, teachers were educated to organise recess activities for 6-8 graders (Troelsen et al., 2014; Toftager et al., 2014), and similar to the findings at New Zealand schools, the teacher-initiated competitions and tournaments appeared to increase recess PA (Mikkelsen, 2014). Activities organised by older students were also found to initiate more play. In Denmark, the concept "Play Patrol" [Legepatrulje] and "GameBoosters" are play activities organised by trained older students and they were found to increase younger children's recess PA (Søndergaard, 2013). The play equipment lending system run by students at the New Zealand schools

has not been observed in a Danish context. A play equipment lending system could presumably expand the variety of play facilities and since several studies have shown a relation between the amount of unfixed play equipment and recess PA (Ridgers et al., 2012; Verstraete et al., 2006; Farley et al., 2008; Willenberg et al., 2010), this initiative might increase recess PA.

6.1.5 Discussion on natural environmental factors

Cold and rainy weather conditions were identified as a factor influencing recess PA, particular among girls. This was in contrast to Ridgers et al. who found no significant variation in children's level of recess PA across varying daily weather conditions or seasons (Ridgers et al., 2006a). The conflicting results could be due to the fact that the children in the study of Ridgers et al. had no option to play inside during recess, whereas the majority of schools in my study let the children stay indoors during cold or rainy weather, supporting more sedentary activities (Dessing et al., 2013; Fairclough et al., 2012). Similarly, in an Australian study children perceived weather as a barrier to recess play because they were forced to stay indoors in both wet and hot weather conditions (Stanley et al., 2012).

6.2 Findings across the layers in the socio-ecological model

The twelve factors found to influence the children's recess PA stem from all layers of the socio-ecological model (i.e., individual, social/cultural, physical, political, and natural environmental factors). A key strength of the socio-ecological model is its focus on multiple levels of influence, which broadens options for interventions (Sallis et al., 2008). However, because the socio-ecological model specifies multiple levels of influence, and there are multiple variables at each level, it may be difficult to determine which of the identified factors are most important. Few studies have quantified the relative contribution of factors on PA in the different layers of the socio-ecological model. Giles-Corti and Donovan (2002) compared the ability of psychological, social, and physical environment variables to explain PA. Even though associations were strongest for the individual variables and weakest for the physical environment variables, each category of variables was significantly related to PA (Giles-Corti and Donovan, 2002). Another study showed that the likelihood of walking at recommended levels was nearly eight times higher in people with both high individual and physical environment scores, compared with those with low scores on both (Giles-Corti, 2006).

It is also important to stress that the socio-ecological model is a simplification of reality and that the factors are interdependent and influence each other (Sallis et al., 2008). For example, I find it difficult to consider the individual layer without considering the social layer. According to my

epistemological standpoint an individual is socially constructed, which mean that children are dependent on their relations and cannot be seen independent from them. For example, one child's bodily abilities will always be assessed and developed in relationship with other children and adults. Moreover, providing the individual child with motivation and skills to change PA behaviour during recess will not be effective if recess environments and policies make it difficult or impossible to change the behaviour. In my study, some children told me that they did not want to play outdoors during recess because they had no outdoor facilities motivating them to play. If they were to be forced to play outside during recess the children explained that more motivating play facilities in the schoolyard were needed. Therefore it is important to understand that there is a reciprocal relationship between the multiple factors across layers. For example, motivating and teaching children to increase recess PA might be implemented together with the creation of recess environments and policies that make it convenient and attractive to change recess behaviour. In summary, the creation of supportive social and physical environments is likely to be more effective in increasing recess PA levels than only targeting a single layer in the socio-ecological model.

6.3 Methodological reflections

My research had its roots in social constructionism and hermeneutic phenomenology and the fundamental assumption was that an individual seeks understanding of the world through verbal interaction with others, which form the individual's subjective opinions (Creswell, 2007). The individual's verbalisation of experiences and opinions during recess was essential for this thesis. It was a deliberate choice to focus my research on the children's point of view during recess. According to "the new child paradigm", it strengthened my research to acknowledge children as individuals independent of the perspective of adults, but it could also be seen as a limitation. Perspectives of teachers, school management and parents may differ from the children's viewpoint and including these adults view in the research could have ended up finding other factors influencing the children's recess PA. However, the children had clear opinions on factors influencing their recess PA and they even suggested ways to mitigate some of the perceived barriers for their recess PA. Like in other child studies they were delighted for their voices and ideas to be heard (Morrow, 1999; MacDougall et al., 2004; Darbyshire et al., 2005). Therefore I am advocating that strategies to increase children's PA should cast children not as passive receivers of instructions from parents, teachers or other adults, but as active influencers of their social and physical worlds.

My thesis is based on a synthesis of results from three different studies, which created a richer form

of data and a greater credibility of results. Exploring barriers across 17 relatively different schools in Study 1 strengthened the transferability (Mason, 2002). The consistency of findings from the children across the 17 schools underpins that the findings are prevalent throughout a variety of school environments in Denmark and widely recognised by children. A limitation of Study 1 was that the school visits were too short to create affinity between the children and me as a researcher. However, in line with Simmel's belief, it is my impression that the children were enthusiastic about showing their schoolyard and spoke freely because I was a "stranger" who, through my objectivity, was an object of confidential information (Simmel, 1971). Morrow expressed a similar impression of the children when conducting her field study (Morrow, 1999). The prolonged case study at one school in Study 3 facilitated creation of a more confidential relationship between the children and me, which eased an in-depth understanding of the explored. To truly understand a complex issue, such as PA behaviour among different subgroups of children, studying one case in-depth is necessary (Flyvbjerg, 2006). While "immersion" is generally acknowledged as a central feature of good ethnographic field research, its counterpart, "distancing", is an important methodical consideration (de Jong et al., 2013). Van Maanen points out that the fieldworker's strategy must be "*making the familiar strange rather than the strange familiar*" (Van Maanen, 1995: p. 20) Being a Danish citizen educated in Denmark, and now having two daughters in a Danish school, made me "native" in my field from the very beginning. Sharing many elements of the culture with the "natives" studied, there is a risk that I might have taken some of the children's perspectives for granted (de Jong et al., 2013; Prasad, 2005). Study 2, conducted in New Zealand, helped me to dissociate myself from the Danish context and see the Danish school context from the outside gaining an analytical distance to my research (Gulløv and Højlund, 2006). Study 2 provided me with an insightful experience of the New Zealand school context but I also went back looking at the Danish school context with a new perspective. Particularly, I obtained a more critical understanding of the Danish school context with reference to how recess is organised and how the schoolyard is designed. An example of this is shown in the below field note excerpt.

On my first day visiting a New Zealand school I am surprised to observe how visible the teachers are in the schoolyard and how engaged they are in the children's play. I direct my thoughts to my own schooling. I can't remember a single situation playing with a teacher during recess. Weren't they just walking around the corridor drinking coffee and throwing children out that made noise indoors? (Field note excerpt, Study 2).

Different qualitative methods were used and combined across studies to address what anthropologist Margaret Mead is famously quoted for saying: “*What people say, what people do, and what they say they do are entirely different things*” (Fitzpatrick, 2011: p. 80). In terms of both findings and validity, this thesis has benefitted from its comprehensive triangulation of qualitative methods. Similar, Darbyshire et al. found triangulation of qualitative methods to offer complementary insights and understandings of their study (Darbyshire et al., 2005). Participant observation was used to help me gain a better understanding of the context (e.g., recess culture, organisation of recess and schoolyard design) and the phenomenon explored (recess PA behaviour), increasing the validity of the results (Kawulich, 2005). Validity was further improved by the use of additional methods in combination with observation, such as interviewing (Kawulich, 2005). In association with participant observation I chose to use two different participatory interview approaches: the go-along interview and the participatory photo interview. The use of participatory approaches was invaluable in capturing the children’s perceptions and experiences of recess PA. Child initiatives during an interview (e.g., guiding a walk around the schoolyard or taking photos of recess play) were found to capture ordinary interactions of children’s daily lives, with the aim of uncovering meaningful content areas that, from an adult viewpoint, might be overlooked (Jorgenson and Sullivan, 2010; Aitken and Wingate, 1993; MacDougall et al., 2004; Darbyshire et al., 2005; Rasmussen, 2004).

As a logical consequence of reducing my authority role as an adult, I gained access to parts of children’s knowledge that real “adults” cannot, similar to Corsaro (Corsaro, 1996). It was clear that I as a researcher was an instrument of data collection (Becker, 1958). Being an instrument of my data collection, I was aware that my gender, age and theoretical approach could affect my research (Kawulich, 2005). For example, I found it much easier to hang out “small talking” with girls than with boys, which meant that I have obtained more observation material describing the girls’ recess behaviour than the boys’. Another female researcher also experienced that her gender was a bias in studying children. However, she further claimed that gender is a factor in wanting to talk, saying that the boys probably would not have opened up more if she was a man (Morrow, 1999). Using observation in combination with interview in my studies reduced this bias (Kawulich, 2005).

My thesis was part of an intervention study including quantitative research approaches (GPS, accelerometers and questionnaires; see design paper, appendix I). I was part of a research group linked to the intervention study, which provided good opportunities for cooperating across methods. I found that my understanding of the children’s recess world increased by incorporating quantitative data in my research work. I benefitted from the synergy of collecting both qualitative and quantitative

data in the intervention study using the accelerometer measurements to categorise children in PA groups for finding the least physically active children in *paper V*. In *paper IV*, I mixed my qualitative data and the quantitative data collected in the attempt to deepening my understanding of the children's PA behaviour during recess by looking at different PA groups.

Although external validation is not the main goal in ethnographic studies (Small, 2009), I have considered the generalizability of the results of my thesis. There is a need to distinguish between different kinds of generalisation, because there are, of course, differences in the conclusions that can be drawn based on the results from different research methods. It is important to distinguish between statistical generalisation and analytical generalisations from an instrumental case study (Flyvbjerg, 2006; Kvale, 1996; Stake, 1995). I agree, and in this thesis I follow Stake, who suggests that instrumental case studies, which seek to gain insight by studying a particular case, can provide a "general understanding" of the particular phenomenon in focus (Stake, 1995). This is also called analytical generalisation (Flyvbjerg, 2006). In this thesis, I used the 17 Danish schools and five New Zealand schools to elaborate on a general understanding of the complex nature of factors influencing children's recess PA. A limitation to be aware of in relation to my cases is that all my participating schools had actively chosen to be a part of The Activating Schoolyards Study, and as such the schools must all be presumed to be interested in health promotion. My study might have benefited from including other schools not involved in a health promotion intervention to see if the children at these schools had perceptions and experiences related to their recess PA differing in fundamental ways from children at those schools involved in these interventions. However, The Activating Schoolyards Study has both enabled my thesis as well as provided the preconditions for it, and my explorations were conducted prior the intervention.

Finally, by the implementation of the new school reform in 2014, PA became a more explicit part of the agenda within the Danish public school system. Even though the reform was not intended to directly affect recess it is important to be aware that at the schools where the reform was well implemented, a health discourse might hypothetically have changed the children's perceptions and recess behaviour between my first DK study (Study 1) and my second DK study (Study 3). However, it is important to notice that less than 1 hour more PA per week was required for children from grade 4-6 (Ministry of Education, 2013).

7. Conclusion and lessons learned

In my thesis twelve factors were identified to influence the children's recess PA: 1) bodily self-esteem and ability, 2) gender, 3) gendered school culture, 4) peer influence, 5) conflicts and exclusion, 6) space and place experiences, 7) lack of play facilities, 8) outdoor play policy, 9) use of electronic devices, 10) recess duration, 11) organised activities, and 12) weather. These factors stem from all layers of the socio-ecological model (i.e., individual, social/cultural, physical, political, and natural environmental factors) but were interdependent. Based on my findings different groups of children (according to gender, play preference and activity level) had different perceptions and experiences linked to factors influencing their recess PA. Researchers and professionals working with children's recess PA should be aware of the different perceptions and not treat children as one homogeneous group in future recess interventions promoting recess PA. These findings speak for implementing a combination of actions addressing factors from different layers in the socio-ecological model to increase recess PA among all types of children.

7.1 Practical implications

One of the most consistent findings from health research is the failure to translate research into practice (Grimshaw et al., 2012). However, knowledge translation from researchers to practitioners, e.g., the schools, is important to promote health (Straus et al., 2013). It has been a driving force in my whole thesis to conduct practice-oriented research with a health perspective. On the basis of my insights into different groups of children's perceptions and experiences of factors influencing their recess PA, I feel strongly about suggesting specific practical implications aiming at different layers in the socio-ecological model to tailor future interventions promoting recess PA in Danish schools. My suggestions are:

- Designing schoolyards with smaller secluded spaces might motivate girls to play outdoors and designing diverse outdoor spaces without predefined activities might also invite children to play less gender stereotyped play.
- Providing varied PA promoting facilities in the schoolyard, for example different unfixed equipment, might motivate some of the indoor staying girls to play outdoors. Implementing a PE equipment lending system controlled by older students might support variation in PA facilities in the schoolyard.

- Rethinking indoor spaces, for example classrooms, as a space for PA might also be a motivation for recess PA among the children who feel comfortable staying in the classroom. For example, showing music videos on a screen to facilitate dancing.
- Implementing a policy supporting outdoor PA during recess in all weather conditions might increase the recess PA level particular among children with low PA levels mostly staying indoors doing sedentary activities.
- Providing teacher-organised play activities with less focus on competition and skills might be implemented as a play opportunity to reduce the hegemonic masculinity and conflicts. Particularly the girls, who want to play gender-mixed soccer but feel excluded by the boys, might possibly be more included in the play if a teacher is controlling the game, instead of the boys.
- Providing spaces (e.g., hidden scrub areas) and play facilities (e.g., castles, moats and foam swords) in the schoolyard that make it possible to move virtual play into the real world might support PA among the boys playing computer games. A more controversial suggestion, also voiced by the children, is implementing a policy to reduce the screen time during recess.
- Prolonging recess duration might enable more time for free play activities, organised activities and use of alternative facilities and spaces e.g., sports hall or swimming bath.
- Fostering self-believe in children lacking bodily self-esteem might increase these children's motivation to use their body. More research in this field is needed to suggest exact how the schools could foster self-believe in the children to increase bodily self-esteem.

7.2 Perspectives and future studies

The importance of long-term public health benefits of increasing children's PA is clear since PA patterns in early life are likely to track into adulthood (Andersen et al., 2004; Kristensen et al., 2008; Telama et al., 2005). Therefore, from a population health perspective schools are a relevant setting for health promotion (Dobbins et al., 2013; Cook et al., 2013; Martinez-Andres et al., 2012). Already, schools play an important role educating and informing about healthy behaviour and PA (Dobbins et al., 2013; Naylor and McKay, 2009). Moreover, the Danish Government took an important step in 2014 maintaining that 45 minutes of daily PA should become part of the timetable in the public school system. However, in connection with implementing the new school reform some schools have renounced recess in favour of more structured learning (Sørensen et al., 2014). I think this is the wrong path to take. I still believe that recess with its possibilities for free play is an important setting for promoting child PA. For example, to hear the children suggesting that their schools were to create

rules limiting mobile phone use during recess to help them be more physically active during recess made a deep impression on me and made me believe that there are “low-hanging fruits” to pick during recess. Thus, by focusing on the children’s perspectives and experiences of recess PA, this thesis contributes with important new knowledge to the research field of recess PA. Implementing actions addressing the factors identified in current thesis might promote the children’s recess PA, creating long-term health benefits.

In future, I will continue to conduct research together with children using participatory approaches to avoid creating interventions based on adult-focused research alone (MacDougall et al., 2004; Rasmussen, 2004). In the near future I will conduct a qualitative post-intervention study in The Activating Schoolyards Study parallel with the quantitative follow-up in spring 2016. I am looking forward to visit the schools again and to being together with the children to explore their perceptions and experiences of the reconstructed schoolyards. This research will add further knowledge to our understanding of children’s PA behaviour during recess.

Furthermore, I will develop my competences in using participatory approaches among other groups of interest in the research field of PA. As part of the activity- and health enhancing physical environments network, I will explore how PA patterns of adolescents and elderly people in their surrounding physical environment are related to health and well-being by conducting participant observation, go-along interviews and participatory photo interviews. Particularly, I am looking forward to test these methods among a group of elderly people as this population group is growing. Implementing PA interventions among this age group is important to promote health and reduce the old age dependency ratio (Rechel et al., 2009). Similar to children, I believe that it is very important to observe and listen to the elderly to understand their PA behaviour and hereby avoid developing interventions not based on the target group’s behaviour and perspectives.

Finally, I want to beat the drum for more explorative research in general to understand facilitators and barriers for being physically active among different target groups in different contexts. My thesis was conducted with the purpose to gain knowledge on 10-13 year-old children’s perceptions and experiences of recess PA within the Danish school context prior implementation of The Activating Schoolyards Study. Explorative studies among specific target groups in specific contexts will allow for new insights and a more complex understanding of the phenomenon explored which are useful knowledge prior conducting intervention studies in the future.

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Papers I-V

RESEARCH ARTICLE

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Barriers for recess physical activity: a gender specific qualitative focus group exploration

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Abstract

Background: Many children, in particular girls, do not reach the recommended amount of daily physical activity. School recess provides an opportunity for both boys and girls to be physically active, but barriers to recess physical activity are not well understood. This study explores gender differences in children's perceptions of barriers to recess physical activity. Based on the socio-ecological model four types of environmental barriers were distinguished: natural, social, physical and organizational environment.

Methods: Data were collected through 17 focus groups (at 17 different schools) with in total 111 children (53 boys) from fourth grade, with a mean age of 10.4 years. The focus groups included an open group discussion, go-along group interviews, and a gender segregated post-it note activity. A content analysis of the post-it notes was used to rank the children's perceived barriers. This was verified by a thematic analysis of transcripts from the open discussions and go-along interviews.

Results: The most frequently identified barriers for both boys and girls were weather, conflicts, lack of space, lack of play facilities and a newly-found barrier, use of electronic devices. While boys and girls identified the same barriers, there were both inter- and intra-gender differences in the perception of these barriers. Weather was a barrier for all children, apart from the most active boys. Conflicts were perceived as a barrier particularly by those boys who played ballgames. Girls said they would like to have more secluded areas added to the school playground, even in large schoolyards where lack of space was not a barrier. This aligned with girls' requests for more "hanging-out" facilities, whereas boys primarily wanted activity promoting facilities.

Conclusion: Based on the results from this study, we recommend promoting recess physical activity through a combination of actions, addressing barriers within the natural, social, physical and organizational environment.

Keywords: Focus groups, Physical activity, Children, Recess, Environmental barriers

Background

Like in many other countries, a large number of Danish school children do not reach the recommended minimum level of 60 minutes of moderate-to-vigorous physical activity (MVPA) per day [1] and physical activity (PA) decreases significantly between ages 9 and 15 years [2]. Engaging in PA has positive effects on both the physical and mental health of children [3-6]. Children spend a substantial amount of their waking hours at

school and since recess PA can contribute with up to 40% of children's recommended daily PA, school recess provides many opportunities for children to be physically active [7]. Targeting school recess periods is important from a health perspective [8] and school-based PA, especially recess PA, has been shown to improve cognitive performance, academic achievement, classroom behavior, attention and concentration [9].

Evidence shows that, in general, boys are more active than girls [10], also during recess [7,11,12]. One study in particular reported that the greatest gender difference in children's PA was found in institutional settings, such as schools, where children relied on self-organized activities during recess and after-school day care [13]. Identifying factors affecting children's recess PA, with a focus on

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gender differences, will aid in informing school policy and developing strategies designed to promote PA in school settings.

To date, research on recess PA has predominantly focused on quantitative measures of correlates of PA, using cross-sectional surveys and school-based intervention studies [11]. The quantitative surveys typically focused on a narrow set of predefined factors, often constructed by adults [14]. To really understand the factors affecting PA it is crucial to listen to children and understand their perspectives [14].

Two comprehensive Australian studies have explored children's barriers for recess PA from a qualitative perspective and identified a lack of facilities/equipment, bullying, school policy, clothes, lack of teacher support [15,16], lack of space, weather [15], playground aesthetics, fundamental movement skills and recess duration [16] are important barriers to recess PA. However, these two studies did not take gender perspectives into account, and little is known about gender differences in PA during recess [11].

There is increasing evidence that the environments we live in have an impact on our behavior, including our inclination to engage in PA [17,18]. The current study builds on a comprehensive socio-ecological model positing that PA behavior results from multiple influences [19]. Inspired by this socio-ecological framework, four groups of barriers have been identified: natural environment (e.g. weather, topography and air quality), social environment (e.g. interpersonal relations and social climate), physical environment (e.g. facilities and surroundings) and organizational environment (e.g. policy and rules).

The aim of this study was to explore gender differences in children's perceptions of barriers to recess PA by using a qualitative approach and the socio-ecological model as a theoretical framework.

Methods

The study is the first phase of a larger Danish schoolyard intervention study: The Activating Schoolyards Study, aiming to improve children's opportunities to become physically active in the schoolyard during recess, particularly the least physically active schoolchildren. All schools in Denmark were invited to participate in the study. Out of the 106 schools that submitted a participation proposal 17 were selected by an expert panel and included in this study. The results from this study will be used as one of the inputs to the planning process of interventions at selected schools in the next phase of The Activating Schoolyards Study. The planning of the specific interventions is driven by the local actors at each school.

The 17 schools represent a wide range of schools. As shown in Table 1, the 17 schools varied in geographic location, school type, number of pupils and their grade-levels,

socioeconomic status (based on parental income), square meters of schoolyard per child, recess rules and number of play facilities. All but one school allowed the use of electronic devices during recess.

In Denmark, school is mandatory for children aged 6–16. Public schools are free of charge and children do not wear school uniforms. Schools are typically organized in three tiers: junior (grade 0–3, 6–9 years old), middle (grade 4–6, 10–12 years old) and senior (grade 7–10, 13–16 years old). Each class has a maximum of 28 gender-mixed pupils [20]. In fourth grade, children attend school for 24.5 hours a week, of which 135 minutes are allocated to physical education (PE) [21]. Approximately 60 minutes are dedicated to recess per day, being distributed over two to four breaks. In general, the lunch recess is the longest break, lasting 25–30 minutes.

The study adheres to the RATS guidelines for reporting qualitative studies. It was approved by the Danish Data Protection Agency (DOK230123). In addition, the study was approved by the school principals and informed consent was obtained from the parents of the focus group participants. The schools and children included in the study were anonymized by giving the schools numbers and changing the children's names.

Research design and procedure

To obtain an in-depth insight into children's perceptions of barriers to recess PA, a qualitative research design was used. Focus groups were selected for this study as the most suitable technique as they have been proven to be an effective method in gathering data among children because they create interactive conversation, evoke memories, help participants to verbalize their responses and enable testing the consistency of statements [14,22,23].

Data were collected during a one-day visit to each of the 17 schools between April and June 2013. The school principal, or a designated teacher, was asked to identify three boys and three girls from the various fourth grade classes (10–11 years), who would represent differing levels of PA. Fourth grade pupils were selected to get an understanding of barriers to PA amongst this age group particularly in the context of the decline in PA from childhood to adolescence [2]. Seventeen focus groups (one at each school) were conducted. In total 111 children (53 boys and 58 girls), with a mean age of 10.4 years, participated in the focus groups. The group-size ranged from five to ten participants.

The focus groups lasted for approximately 60 minutes and were conducted during school hours. The focus groups were filmed using an iPad mini to record interactions [24] and to document who said what. To ensure consistency all focus groups were conducted and transcribed by the lead author.

Table 1 Main characteristic of the 17 schools in the study

Characteristics	Number of schools n = 17 (100%)
Region:	
Capital region	4 (24)
Region Zealand	2 (12)
Region North	2 (12)
Central Denmark	5 (28)
Southern Denmark	4 (24)
School type:	
City	12 (71)
Urban	5 (29)
Number of pupils:	
> 600	9 (52)
400-600	4 (24)
< 400	4 (24)
Number of fourth grade classes per school:	
1	3 (18)
2	5 (29)
3	7 (41)
4	2 (12)
Fourth grade pupils' relative hierarchical position at the school location:	
The oldest	4 (24)
The "in-betweeners"	12 (70)
The youngest	1 (6)
Parents income range*:	
≥ average school in Denmark	8 (47)
< average school in Denmark	6 (35)
Size of schoolyard per child (m ²):	
< 10	4 (24)
10-49	7 (40)
50-99	4 (24)
> 100	2 (12)
Recess rules for fourth grade:	
Must stay out in recess	4 (24)
Must stay out in recess during summertime	3 (18)
Must stay out in one of the two main recesses	5 (29)
The children must decide themselves	5 (29)
Number of play facilities for fourth grade:	
<10	3 (18)
10-15	5 (29)
16-20	8 (47)
>20	1 (6)

Table 1 Main characteristic of the 17 schools in the study (Continued)

Use of electronic devices allowed in recess:	
Yes	16 (94)
No	1 (6)

*Published data from Statistics Denmark. Three schools are not included why they have been merged after the calculation.

Using the socio-ecological model as a theoretical framework, a number of questions were developed to prompt information about natural, social, physical and organizational environmental influences, as outlined in Table 2. The procedure and questions were pilot tested at two of the 17 schools.

To facilitate the discussion and evoke memories, each focus group included a go-along group interview in the schoolyard, where the children showed the moderator places or spaces in the schoolyard that they used during recess [25]. An A3 sized Google Earth aerial photograph of the schoolyard was used as a visual tool [15,26]. Symbols, representing various activities, were placed on the map by the moderator to indicate where different types of activity took place.

At the end of the focus group discussions an open brainstorm session was conducted. The groups were told to write down all barriers that they could think of on post-it notes. In contrast to the rest of the focus group activities, the post-it note activity was done in gender segregated groups. This was to be able to study both inter- and intra-gender differences in the perceptions of barriers to recess PA.

Using multiple qualitative methods in the focus groups allowed for triangulation of the results as the different methods supplemented each other and provided a more complete picture [24,27].

Data analysis

Recordings from the focus groups were transcribed after each focus group and the analytical process began during data collection whereby initial insights were used to refine the guide used for structuring the focus groups [28]. Upon completion of data collection, focus group transcripts and post-it notes were ordered with the explicit purpose of identifying barriers influencing engagement in recess PA across the schools [29]. The importance of barriers was deducted from those listed most frequent on post-it notes, those that took up much time during the interview, or were discussed with a lot of enthusiasm by the children.

As a first step, an overview of the range of barriers identified in the 17 focus groups was created to guide the development of a set of barriers perceived by the children [30,31]. Data from the post-it notes were analyzed using a deductive content analysis process involving

Table 2 Procedure and questions used for the focus groups

Phase	Activity	Setting	Duration
1. Open focus group discussion	<p>Firstly, informal conversation and <i>ice-breaking</i> activities were used to create a relaxing environment. Then a discussion was conducted to identify barriers that influence children's recess play. Questions used were:</p> <ul style="list-style-type: none"> • What are your experiences around recess? • What do you do during recess? • Who are you playing with? • Who initiates play? • Is there something you want to do in recess that you cannot or may not do? What was this? • What do you think about your schoolyard? • Can you explain what physical activity is? • Do you like being physically active? Why/why not? • What influences your physical activity during recess? 	Classroom/meeting room at the school	30 minutes
2. Go-along interview	The children pointed out where they usually played during recess, the activity they played and who they played with. A Google Earth aerea photograph of the schoolyard was used as a tool (by the moderator), to indicate where different activities took place.	Shared indoor and outdoor areas at the school	20 minutes
3. Post-it note activity	An open brainstorm to identify significant barriers to engaging in physical activity during recess. The groups were told to write down all the barriers that they could think of on post-it notes.	Classroom/meeting room. Gender separated groups	10 minutes

coding, categorization, and summarizing [32]. The data were coded and arranged under headings derived from the social-ecological model (i.e. natural, social, physical and organizational barriers). Under each heading the coded comments were clustered into categories based on similar content. Then a thematic analysis was conducted to produce an in-depth description and understanding of the transcripts from the focus groups' open discussion and go-along interview [30,31]. Phrases from transcripts that referred to barriers were highlighted and grouped, from which themes and subthemes emerged. Since themes were established based on a triangulation of different data sources, this process adds to the reliability of the study [33].

Finally, the data were examined from a gender perspective focusing on similarities and differences between boys' and girls' participation, activities and expressions in relation to recess PA.

Results

Based on the post-it note activity 16 different barriers were identified: one natural barrier, four social barriers, seven physical barriers and four organizational barriers. Each of these barriers had varying degrees of perceived importance (Table 3).

For both boys and girls the five perceived barriers mentioned most were: weather, conflicts, lack of space, lack of play facilities, and use of electronic devices. These five barriers were also prominent in the focus groups' open discussion and go-along interview. The post-it note activity showed no gender differences for these

five barriers. However, the open discussion and go-along interview data showed that boys and girls perceived these five barriers differently. The following sections provide an in-depth description of these five barriers from a gender perspective.

Weather – a natural barrier

Bad weather conditions seemed to be one of the main barriers to recess PA. Many children did not think it was fun to play outside in rainy or snowy weather. Some children commented that snow and rain stopped them from using facilities such as courts and fields for ballgame. Others said that they felt "freezing" and that bad weather conditions did not motivate them to participate in outdoor activities. Girls especially expressed bad weather conditions as a barrier to recess PA. One girl said:

"It's not about bad weather but about how you feel about the weather [...]. We like it when it's a bit warm because then it's much more fun to be outside because you can do more. When it's cold or rainy then you really don't want to do so much". (Girl, school 12)

While girls preferred to stay indoors during recess doing sedentary activities when the weather was cold or rainy this was not the case for all boys, with some preferring to be in the playground regardless of weather conditions. One boy said:

"I am definitely outside playing even if it is raining". (Boy, school 12)

Table 3 Perceived barriers to recess PA mentioned in the post-it note activity

Barriers mentioned in post-it note activity	Total % (n = 34)	Girls % (n = 17)	Boys % (n = 17)
<i>Natural</i>			
Weather	50	65	35
<i>Social</i>			
No-one to play with/not allowed in group play	9	12	6
Conflicts (disagreement, dominance)	41	35	47
Peer influence	15	18	12
Lack of teacher support/delayed by teacher	9	12	6
<i>Physical</i>			
Occupied play facilities	12	12	12
Lack of maintenance	15	12	18
Lack of grass areas	9	12	6
Lack of space	29	29	29
Lack of play facilities	68	71	65
Lack of access to play facilities	12	12	12
Boring play facilities	6	6	6
<i>Organizational</i>			
Recess duration	12	12	12
PE prior to recess	6	6	6
Allowed to stay inside	6	6	6
Use of electronic devices	29	29	29

While weather conditions are uncontrollable it was interesting to note that the effects of weather conditions seemed to be strengthened by the school's recess policy. At many schools the children could decide for themselves whether they wanted to stay inside during recess doing sedentary activities, particularly in the winter and autumn season (Table 1). Additionally at many schools the children were not allowed to use some outdoor areas during rainy weather in order to prevent dirt being carried indoors. Three schools allowed children access to the sports hall during recess, which both boys and girls liked.

Conflicts - a social barrier

At almost every school social relations during recess were a topic of great discussion. The majority of children identified conflicts, caused by disagreement and dominance, as an element that disrupted play. Both boys and girls often argued about what to play, where to play and who was allowed to participate in the play. Boys in particular had conflicts when playing soccer or other ballgames. The reason for such conflicts was often caused by the importance placed on winning. Many of the boys took the ballgame so seriously that team constitution and rules of play often caused disagreement and sometimes

even fights. A conversation between the moderator and three boys highlighted this:

Moderator: Are there often conflicts?

Michael: Yes, at the soccer field

Ben: Almost every day

Nick: Often somebody fights, but not every day

Moderator: What are they fighting about?

Ben: If it is a goal or a free kick

Nick Or hand ball. They were fighting today about if there was a hand ball

Ben: Alex, he just wants to win (school 2)

Conflicts caused by dominance were also experienced as a significant barrier to recess play. Boys felt dominated by older boys who "wrecked" their play by taking their equipment (e.g., balls), facilities (e.g., soccer field) or disrupting games (e.g., throwing snowballs). This both ruined their play and started conflicts which they felt were time consuming and a waste of time. One boy said:

"The older ones can just, well, be a little annoying when they come and say that they had the soccer field first. Then we have to find a teacher and it ends up that

we have to leave because they are lying. They just say: “We had it first”. It is quite annoying”. (Boy, school 17)

Many girls wanted to play ballgames but they realized that the ballgame areas were dominated by boys. Girls felt that they were not allowed to join the boys’ ballgames or if they were allowed to join, that boys did not include them in the game (e.g. boys did not pass the ball to them), meaning the girls stood passively waiting for the ball. At a few schools, where there were several soccer fields, girls were playing soccer by themselves, however, at most schools the only opportunity for girls to play soccer was by joining the boys. One boy and two girls discussed this as follows:

Rita: They do not want girls to take part [in soccer games] because they are not good enough

Simon: In my class girls are allowed to take part

Isabella: But then they do not pass the ball to us

Simon: Yes exactly, I think that the boys say yes to them so that the girls do not complain to the teachers (school 15)

The children realized it was difficult to solve the conflicts by themselves and that it took a lot of effort and time during recess. They did not think the teachers were of any help because it was difficult to find a teacher in the schoolyard. One boy explained:

“You actually use all your recess finding a teacher first and then you can throw them off [Older pupils from the soccer field]”. (Boy, school 7)

Some, mainly girls, thought it would reduce conflicts and create more play across the genders and different age groups if teachers were involved as play initiators, creating teams or acting as referees.

Lack of space – a physical barrier

The number of square meters per child for fourth grade children differed widely between schools (Table 1). Children reported feeling “crowded” in the schoolyard at schools with small outdoor areas and lots of children. It complicated recess PA as many children were doing different activities in the same area at the same time and often they bumped into each other which led to conflicts. One girl said:

“We went to another school before where there was really a lot of space and we never started arguing about anything because there was so much space”. (Girl, school 16)

Because of overcrowding and excessive noise in the small schoolyards it was mentioned that in particular

girls, often sought out small secluded areas where they could stay in smaller groups. Even though children at some schools were not allowed to stay indoors during recess, indoor areas were popular places for these girls to go to for quiet sedentary activities. A conversation between the moderator and three girls highlighted this:

Lana: Typically, we sit on those couches and just talk [At the library]

Alba: In fact, we are not allowed to stay in here at all but we [girls] need to have a place to stay

Moderator: So you wish that you were allowed to stay here?

Catharina: Yes because there are not so many [children] in here so it’s quiet (school 7)

The fact that girls expressed a lack of space seemed not only to be related to having a small schoolyard, but also to the desire of having smaller areas for themselves. Even at schools with plenty of space per child, many girls were still attracted to smaller secluded areas.

At one school with a small schoolyard the school allowed the oldest pupils to go to a nearby park during recess. At this school it was attractive to go to the park as the older pupils had it all to themselves and therefore they took advantage of their special privilege. One girl expressed it as:

“It’s nice that you just can go there [to the park] and say “whew” now there are not so many [children]”. (Girl, school 14)

Lack of play facilities – a physical barrier

While the number of play facilities at each of the schools varied widely, the principal barrier identified to recess PA was a lack of schoolyard facilities, defined as both buildings (e.g. gymnasiums), courts or equipment (fixed/unfixed) (Table 1). Almost every child mentioned facilities they did not have, or had but which did not live up to their expectations. At those schools where children were allowed to stay indoors (under certain circumstances) (Table 1), many children preferred to stay in the classroom during recess because of the perceived lack of play facilities. One boy stated:

“I mostly like to stay indoors. I do not really think there is anything to do outdoors [...]. Well, we do not have any grassy soccer field. I miss that and some larger goals”. (Boy, school 7)

Even though all schools had soccer fields of some sort, the most wanted play facilities among the children, in particular boys, were soccer related. Many boys expressed a need to be physically active during recess and

they wanted facilities they could use for PA (e.g. climbing facilities for tag, a large slide, an obstacle course, or skateboard and parkour facilities). Girls also wanted climbing facilities, but with another use in mind. Many girls requested facilities which could provide a smaller cozy place where they could hang out and isolate themselves in small groups. Bird's nest swings and small huts were other examples of sought-after facilities among girls. A dialogue between the moderator and three children went as follows:

Henrietta: It could be nice with swings, for instance such big swings like a nest because they are cozy and then you can sit down there and talk and you still get fresh air and at the same time you have fun

Maria: Yes, and climbing nets so you can climb up and down and then there is a little hut up there where you can sit and talk

Moderator: Boys, do you also need swings?

William: Not that much

Henrietta Maybe it's not for soccer boys but it's cozy for girls (School 1)

Most play facilities that were provided were quickly occupied and the lack of facilities also resulted in a rush to get to the facilities first. The children pointed out that in particular, the soccer fields and swings were often occupied. This meant they had to eat their packed lunch quickly and in some cases ask their teacher if they could begin recess earlier to get to the facilities first. If the boys did not get the facilities they wanted, they were often very creative in playing something else or using alternative facilities (e.g. benches were used as soccer goals, door sills and stairs as ramps for skateboards and scooters and playhouse roofs as parkour facility). In contrast, girls engaged in more passive activities when the facilities they wanted to use were occupied. Two girls explained what they did when facilities they wanted were occupied:

"Then we have to stay next to the swings and wait until they leave". (Girl, school 12) "Then we just go into our classroom and talk". (Girl, school 8)

Use of electronic devices – an organizational barrier

At the 16 schools which allowed the use of electronic devices during recess (Table 1), almost every child in the fourth grade brought a smartphone or tablet to school on a daily basis. In addition to that, children at five of the schools were allowed to use library or classroom computers during recess. Both boys and girls used computers, smartphones and tablets for gaming, Facebook, YouTube, Instagram and to play music. Many of the children stated

that their smartphone or tablet was tempting to use during recess periods. One boy commented:

"It attracts us like a magnet". (Boy, school 9)

However, they also reported that allowing the use of those electronic devices during recess acted as a barrier to getting fresh air, socializing, improving their concentration and PA. Use of electronic devices was mostly perceived as a barrier for recess PA by those who preferred to play physically active games. Some children pointed out that there were not enough children for group play because many of their classmates were absorbed in their mobile phone. Furthermore, some children reported playing on a computer or smartphone during recess because of peer pressure even though they would rather do something physically active. A conversation between the moderator and four children went as follows:

Simon: Sometimes I think it is a bit annoying that everybody sits at the computers [...]. I'm actually the only one who runs around outside while everybody else sits and plays on the computer

Moderator: Why is it annoying?

Harry: Because we are not really together and it is very boring

Sally: I think it is a bad rule

Harry: Yes, I think they [the school management] should make a new rule so you were only allowed to stay inside playing on the computer in the lunch break and it was closed down in the other recess periods

Sally: If they were not allowed to sit at the computers or in the classroom then everybody would be outside, you see [...]

Moderator: What would you [addressed to Tom, who plays on the computer every recess periods] do if you were not allowed to play on the computer?

Tom: Then I would play soccer outside

Moderator: If you could choose between playing on the computer or soccer what would you choose then?

Tom: Soccer

Moderator: But why then are you playing on the computer?

Tom: Just because my friends do (school 15)

As mentioned in the above conversation, many children thought that using computers or smartphones during recess was getting out of control because of the barriers it caused, and thought it necessary to reduce the use of electronic devices. Some thought rules were needed and having "screen breaks" on some of the school days or in some recess periods were mentioned as a solution. Others suggested that more play facilities in the schoolyard could solve the problem.

Discussion

The present study set out to contribute to the current literature about children's recess PA by examining and describing children's perceptions of barriers to school recess PA, including identification of why recess PA differs between boys and girls. Five key barriers to recess PA emerged: weather, conflicts, lack of space, lack of play facilities, and use of electronic devices. Boys and girls identified the same barriers as the most important, but dealt with the barriers differently.

Cold and rainy weather conditions were identified as a significant barrier to recess PA. This was in contrast to Ridgers et al. who found no significant variation in children's level of recess PA across varying daily weather conditions or seasons [34]. This variation could be due to climatic differences between the studies (UK versus Denmark). Another explanation could be that the children in the study of Ridgers et al. had no option to play inside, whereas the majority of the current study's schools let the children stay indoors during winter and bad weather, which supported more sedentary activities and especially those activities that girls choose to do. The importance of the school's policy on recess PA was also seen in an Australian qualitative study where children had to stay indoors in both wet and hot weather conditions [15].

In the present study, conflicts were perceived as time consuming and a barrier to recess PA, especially among competitive sports-minded boys. Another study also found that conflicts were time consuming in PE lessons, suggesting that up to one quarter of lesson time was taken up by conflicts related to organization of teams, activities and game rules [35]. The lack of teacher present in outdoor areas seems to be related to conflicts, hence increased teacher supervision could lead to faster conflict resolution and thus provide increased PA, particularly among boys [36,37]. However, in our study girls also described benefiting from increased teacher supervision, in particular if the monitoring teachers participated in the play then girls experienced reduced conflicts and less boy dominance.

Lack of space was perceived as an important barrier to recess PA, which was similar to other qualitative studies [15,38]. This is also supported by findings from quantitative studies where more play space per child was positively associated with recess PA [39,40]. Conversely however, Sallis et al. found that play area size was not significantly associated with recess PA [37]. However, their study assessed available space in different schoolyards rather than the space available per child. In our study both boys and girls felt that lack of space was a barrier, but girls also verbalized a desire for smaller secluded areas, possibly because boys tend to dominate the main areas of the schoolyard [41-43]. Some studies have suggested that recess strategies to increase PA should consider reducing the dominance of soccer in schoolyards

by allocating specific areas for other activities and thereby provide more space for those who do not want to play soccer [44,45]. However, in our study many girls also indicated they wanted to play soccer.

The most commonly mentioned barrier to recess PA, perceived by both boys and girls, was a lack of play facilities. This is in line with previous qualitative studies [15,16,46]. A review also found a strong positive association between recess PA and overall facility provision as well as the provision of unfixed equipment [11]. Similarly Zask et al. reported that the ratio of balls to children was related to vigorous physical activity (VPA) [47]. In this study both boys and girls emphasized a lack of soccer facilities and equipment, but there were gender differences in the most desired facilities. Boys primarily preferred physically activity promoting facilities (e.g., multi courts, obstacle course, climbing frames, skateboard and parkour facilities) whereas girls tended to prefer smaller secluded places where they could hang out and isolate themselves in smaller groups (e.g., bird's nest swings, climbing frames and small huts).

In addition to those barriers which have previously been identified [11], this study also found that the use of electronic devices during recess were seen as a barrier to PA. While the children felt attracted to using electronic devices during recess, they also realized the use of electronic devices had consequences in relation to PA. A study, in a non-school setting, found that the young people with higher levels of computer use were the most inactive and were more likely to report computer use as a barrier to PA [48]. Conversely, children's use of mobile phones when playing away from home has been found to be a facilitator for play because it helped alleviate parents' safety fears [49]. We found that the use of electronic devices was not only a barrier for recess PA among the children who used electronic devices, but also for their classmates who preferred to play group games. The use of electronic devices seemed so widespread that the children themselves thought it necessary to reduce use of electronic devices, suggesting restrictions or more play facilities in the schoolyard. The reason electronic devices have not been previously identified as a barrier to recess PA is probably due to electronic devices being a relatively new phenomenon. Additional research is needed to explore the impact of this new barrier to recess PA and suggestions for future directions with regard to this finding are needed.

Strength and limitations

A strength of this study is the use of multiple methods and analysis strategies. This facilitated in attaining a much richer form of data and greater credibility of results. Using this method at 17 relatively different schools involving 58 girls and 53 boys strengthens the transferability of the study. The consistency of findings from the children across

the 17 different schools underpins that barriers identified are prevalent throughout a variety of school environments and widely recognized by children.

A limitation of the study was that there was only one focus group at each of the 17 schools. More focus groups at each school would have enabled a more detailed description of the schools. However, the 17 schools are as institutions homogeneous in structure and our purpose was not to create deep descriptions of each school. We preferred to look across the different schools included in the Activating Schoolyard Study [29]. Another limitation is that the focus groups only included fourth grade children. Perspectives of adolescents, teachers, school management and parents may differ from the children's viewpoints. However, it was a deliberate choice only to study children's perceived barriers. This decision was made in line with the new paradigm of childhood which states that children's culture is worthy of study in its own right, independent of the perspective and concerns of adults [50]. Moreover, our findings indicate that the children are keenly aware of the importance of the barriers to recess PA. Throughout the focus groups, the children clearly articulated how their perceived barriers created significant obstacles to establishing healthy behaviors during recess and they suggested ways to mitigate some of these barriers.

Conclusion

Five key barriers were identified by both boys and girls: weather, conflicts, lack of space, lack of play facilities, and a newly-found barrier, use of electronic devices. While boys and girls identified the same barriers, there were both inter- and intra-gender differences in the children's perceptions of these barriers. These findings suggest that there is a need to use this methodology to better understand the barriers from a gender perspective and to search for new barriers in order to provide a more complete description of influences on children's PA behavior during recess.

We recommend that school recess PA is promoted through a combination of actions that address barriers within the natural, social, physical and organizational environment. This implies using a socio-ecological approach focusing on different settings, e.g. implementing school policies which supporting activity in all weather conditions, more teacher presence during recess, recess activities organized by older students or teachers, creation of outdoor boy and girl zones, organization of student-driven play equipment stations, and regulations of electronic devices, particularly smart phones and tablets, during recess. These recommended actions are relatively low-cost, but require a high degree of commitment and motivation from both school management and teachers to be successfully implemented.

Abbreviations

MVPA: Moderate to vigorous physical activity; PA: Physical activity; PE: Physical education; VPA: Vigorous physical activity.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

CSP carried out the focus groups, analyzed the data and drafted the manuscript. TTT and JT participated in analyzing the data. JS participated in drafting the manuscript and analyzing the data. CSP and TTT designed the study. CSP and JT conceived the study. All authors read and approved the final manuscript.

Acknowledgements

The study was supported by The Danish Cancer Society. The Activating Schoolyards study is part of the Centre for Intervention Research in Health Promotion and Disease Prevention, National Institute of Public Health, University of Southern Denmark. We thank the participating schools, teachers, children and families for their enthusiastic participation in the study.

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Received: 1 April 2014 Accepted: 19 June 2014

Published: 23 June 2014

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doi:10.1186/1471-2458-14-639

Cite this article as: Pawlowski et al.: Barriers for recess physical activity: a gender specific qualitative focus group exploration. *BMC Public Health* 2014 **14**:639.

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European Physical Education Review
1–17

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DOI: 10.1177/1356336X14561533

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Abstract

Boys are more physically active than girls and the greatest gender difference in children's physical activity is found in institutional settings such as school recess. However, research on gender relations, performances and practices that maintain gendered differences in physical activity during recess is still limited. Drawing on a qualitative dataset and a social constructivist gender view, the

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aim of this study was to investigate how construction of gendered activity patterns and social positions in the schoolyard lead to gendered practices in self-organized play during recess. At 17 Danish schools a total of 460 minutes of recess were observed and 17 go-along group interviews (one at each school), including in total 111 fourth graders (58 girls), were conducted. We found six gender typologies with varying behaviours, needs and power relations. The majority of children were prejudiced in their play, reinforcing gender binarism with boys being more physically active than girls. However, we also found groups such as soccer-playing girls and sedentary computer gaming boys who defied the gender stereotypes. These groups felt limited in their activities because of a hierarchy where not being skilled and sporty implied a lesser status in the hegemonic masculinity and even exclusion from play. More detailed research into what is required for particularly the least active groups is needed to successfully increase both the girls' and overall physical activity levels.

Keywords

Children, physical activity, self-organized recess play, qualitative approach, 'doing gender', hegemonic masculinity

Introduction

A high number of school-aged children do not reach the recommended minimum level of 60 minutes of moderate-to-vigorous physical activity (MVPA) per day (Currie et al., 2012). Physical activity (PA) decreases significantly between the ages of nine and 15 years old (Nader et al., 2008). This has led to an increased focus by researchers and policy makers concerned with children's health on PA accumulation through independent outdoor play, especially in high-income countries (Brockman et al., 2011; Sallis et al., 2000; Veitch et al., 2008). The health benefits of sufficient childhood PA include improved psychological well-being, bone density, and motor skill development (Lubans et al., 2010; Rethon et al., 2010; Tobias et al., 2007), reduced waist circumference, less clustering of cardiovascular disease risk factors (Andersen et al., 2006) and lower levels of body fat mass later in life (Janz et al., 2009). Moreover, research has shown that children's self-organized and often physically active play in outdoor areas, such as schoolyards, gardens and parks, contributes to the development of their social and creative skills (Sawyers, 1994).

As in other high-income countries, Danish boys are more physically active than girls (Currie et al., 2012; Dencker and Andersen, 2008; Eiberg et al., 2005; Hallal et al., 2012; Nielsen et al., 2011; Riddoch et al., 2004; Sallis et al., 2000). Although gender differences in school have long been a topic of concern (Smith, 2007), the biggest gender gap in Danish children's PA was found in institutional settings, such as school recess and after-school care (Nielsen et al., 2011). Gender segregation is extensive during recess as children have a greater choice and because of less teacher control (Nielsen et al., 2011; Swain, 2005). In some studies the gender difference in recess PA was thought to be explained by boys dominating the main areas of the schoolyard (Schmidt, 2009; Swain, 2000; Thorne, 1993). Other studies ascribed the gender difference in recess PA to the types of activities boys and girls engage in (Blatchford, 1996; Blatchford et al., 2003; Boyle et al., 2003; Nielsen et al., 2011). In European studies in particular, playing soccer is mentioned as a popular boy activity influencing the gender difference in PA level (Blatchford et al., 2003; Nielsen et al.,

2011; Schmidt, 2009). However, the issue of children and gender is much more complex (Thorne, 1993) and little is known about how individual performance and social interactions influence and shape the gender specific selection of activities that influence children's PA level during recess (Broekhuizen et al., 2014; Paechter, 2010; Ridgers et al., 2012).

The majority of studies reporting on gender differences in recess PA are quantitative in nature, focusing on objective measurements and the broader patterns of gender differences and PA (Ridgers et al., 2012). We argue that for an improved understanding of the determinants of gender differences during recess it is firstly crucial to understand cultural practices that shape and are shaped by (gender) appropriate activities during school, particularly recess periods, and secondly provide children with the opportunity to voice their perspectives and experiences that explain locally constituted gender differences and performances (Darbyshire et al., 2005).

Theoretical background

To gain insight into the gender complexities of children's recess play, this study draws on a social constructivist gender viewpoint. In gender studies, 'doing gender' is a widespread concept explaining gender as a psychologically ingrained social construct that actively surfaces in everyday human interaction (Kessler and McKenna, 1978; Thorne, 1993; West and Zimmerman, 1987). Or in other words, we assume that gender conforming or non-conforming activities are constructed through the child's socialization and embodied cultural and social practices in the schoolyard. However, a child's options to socially and culturally 'do gender' through his or her recess actions can become challenged by the heterocentric discourse belonging to the traditional binary gender view (Butler, 1990). Children's identity construction in schools has been shown to produce a gender order where some boys in some circumstances suppress identities they perceive as 'feminine' (Connell and Messerschmidt, 2005; Smith, 2007; Swain, 2005), which is referred to as hegemonic masculinity (Connell, 1987, 2005; Huuki et al., 2010; Swain, 2003, 2005). In this article, the concept of hegemonic masculinity is used to explain how some boys in some situations maintain dominant social roles over children perceived as 'feminine' (Connell and Messerschmidt, 2005). The above described gender concepts create possibilities to move beyond the differences in the types of activities children engage in and to explore the layered meaning children assign to their activities and interactions with children of the same or opposite sex.

Aim

By using a qualitative approach and gender concepts as theoretical framework, this study contributes to the growing literature on gender differences in children's PA levels during recess (Currie et al., 2012; Dencker and Andersen, 2008; Eiberg et al., 2005; Hallal et al., 2012; Nielsen et al., 2011; Riddoch et al., 2004; Sallis et al., 2000) by exploring children's own experiences of and justification for gendered play by drawing on observations and go-along interviews. In order to improve understanding of the influences on girls' as well as boys' PA level, the aim of the study is to explore how the construction of gendered activity patterns and social positions in the schoolyard lead to gender reinforcing practices in self-organized play during recess.

Method

Data collection and participants

The study combined observations with go-along group interviews to get an understanding of children's gendered activity patterns and social positions in their self-organized play during recess. Observation is an effective method of gaining insight into children's movement patterns, behaviour and social interaction during school hours (Huuki et al., 2010; Paechter, 2010; Smith, 2007; Swain, 2000, 2005; Thorne, 1993). The main advantage of group interviews with children lies in the fact that group interactions can reveal and highlight the children's perceptions and attitudes and provide a framework for understanding their culture (Darbyshire et al., 2005; Horner, 2000). Triangulating the methods improved the reliability and compensated for their individual limitations and gave a more complete clarification of the field (Darbyshire et al., 2005; Shenton, 2004).

Observation and go-along group interview data was collected during a one-day visit at 17 Danish urban and rural schools between April and June 2013. All participating schools are part of a Danish schoolyard intervention study, The Activating Schoolyards Study, which aims to improve children's opportunities to become physically active in the schoolyard during recess, particular the least physically active schoolchildren. Data for this article was collected by the first author before the intervention study started to gather baseline information. The 17 schools were homogeneous in their institutional structure (i.e. organization of lessons and recess) but represent differences in geographic location, number of pupils and grade-levels, socioeconomic status (SES), square metres of schoolyard per child and number of schoolyard facilities (Pawlowski et al., 2014). The data was collected among fourth graders (age 10–11) to get a better understanding of self-organized recess play amongst an age group that starts to show a decline in PA levels (Nader et al., 2008).

Approval for the study was granted by the Danish Data Protection Agency in April 2013 (2013-41-1900). In addition, the study was approved by the school principals and informed consent was obtained from parents of children participating in the go-along group interviews.

Observations. A total of 460 minutes of recess were observed. The observations were focused on children attending fourth grade by observing places where fourth graders were during recess, e.g. classrooms, shared indoor areas, soccer fields, scrub areas and playgrounds. The observer was sometimes close to the observed and sometimes at a distance. Occasionally the observer asked the children questions about what they were doing but mostly the observer did not interact with the children. Observations were documented with field notes and photos (Emerson et al., 2011).

Go-along group interviews. Seventeen go-along group interviews (one at each school) were conducted. Participants were purposely sampled with help from the school principal or a designated teacher who was able to recruit children from the fourth grade with diverse characteristics to ensure variation in gender, social backgrounds and PA level to allow for contrasting opinions. This approach was employed to ensure both homogeneity and heterogeneity within the groups (Krueger and Casey, 2002; Morgan, 1997). The group-size ranged from five to 10 participants. A total of 111 participants (58 girls and 53 boys), with a mean age of 10.4 years, participated in the go-along group interview.

The group interview participants took the first author around their schoolyard and shared indoor areas. This go-along approach was chosen to help the children recall memories of their movement

and behaviour patterns during recess (Kusenbach, 2003). Prompts during the walk included for example, 'What do you do during recess?' 'Who are you playing with?' 'Who initiates play?' 'Have you tried to be excluded from a game?' Moreover, a large aerial photograph of the schoolyard was used as an additional tool to gain insights into children's justification for gendered self-organized play. The first author placed activity icons on the aerial photograph to indicate the location of different activities (Stanley et al., 2012; Veitch et al., 2008).

The go-along group interviews lasted for approximately 40 minutes and were conducted during school hours. The interviews were filmed using an iPad mini[®] to record both the verbal and non-verbal interaction of participants. To ensure consistency, all interviews were both conducted and transcribed by the lead author. The procedure was pilot tested at two of the 17 schools to clarify whether the groups should be same-gendered or mixed-gendered. Both group constellations worked well, but as we wanted to explore gender relations both across genders and within the same gender we decided to conduct mixed-gender group interviews.

Data analysis

Upon completion of the fieldwork, field notes, photos, aerial photographs and interview transcripts were coded to identify children's gendered activity patterns and social positions during recess. During the first step of a thematic analysis different typologies of gendered activity emerged, primarily based on the children's own categorization. In the second step, the data was analysed against the theoretical framework for a deeper gender analysis and improved understanding of the data. Themes were developed through a cross-sectional coding and re-coding process, in order to identify commonalities and differences within and between schools and genders (Mason, 2002). A set of analytical categories emerged (Hammersley and Atkinson, 2007); gender discourse in play, play typologies, crossing gender borders, play hierarchy, and the school's role in recess play.

In the results section, field note extracts and excerpts from the go-along group interviews are used to illustrate the reinforcing gender construction during recess. Both the schools and participants were anonymized using numbers and pseudonyms, respectively.

Results

Heterocentric discourse in play

In the conversation with the children it became obvious that the children were prejudiced in their play, reinforcing gender binarism. They labelled play as either 'girls' play' or 'boys' play' depending on to what extent the play demanded bodily competences. Typically, 'boys' play' was defined by sport activities that demanded strength and fastness, while 'girls' play' was characterized by less physical demanding activities, often sedentary activities, expressed by a participant as follows: 'Soccer and such team sports are typical boy sports. Boys often do sport. Some girls also do horse riding, knitting and choir, where you are not moving, you see. Not many boys want to do that' (girl, school 10).

Most children chose activities during recess with same-gendered children. They identified the groups they engaged with through the activities they carried out, as well as gender, as explained by a boy:

I really don't think you think about it, but a class separates into different groups based on what you do during recess. I have recognized that in most classes there are the soccer boys, a group of boys playing soccer in every recess [. . .] and then there are those in the classroom. It's mostly girls (boy, school 15).

On first sight, children categorized their play following a heterocentric discourse reinforcing the stereotypes of gendered play. However, on a second sight our findings suggest that these pre-disposed activities were not enacted by all children. In the following we introduce the gender views children embodied and voiced during data collection as well their stated resistances to these views and use them to reveal and discuss constituted practices and beliefs that shaped and were shaped by these diverse gender identities.

Doing (gendered) activities

Six different gender typologies regarding recess play emerged from the data: the talking girls, the soccer girls, the dancing girls, the soccer boys, the 'chasing game' boys, and the nerds. The labels talking girls, soccer girls, soccer boys and nerds emerged from the children's verbalization of different groupings regarding their recess play. The dancing girls and the 'chasing game' boys were grouped and categorized by the authors based on observations of smaller groups of children doing comparable activities. The typologies are viewed as relational depending on circumstances and are not seen as constants.

The talking girls. At all schools there were girls who belonged to small intimate groups, labelled the 'talking girls'. These groups were non-inclusive to other children as a girl exemplified: 'In our class there is a girl group that just walks, I really don't know what they are doing, but sometimes when I ask if I can join them, they always say no' (girl, school 14). Some groups even walked arm in arm to signal the exclusivity of their group and that they were not looking for interaction with any other children. During the observations, we saw many of these intimate girl groups strolling around the schoolyard. Socializing by verbal communication was highly important for these girls during recess. A girl explained: 'We are not allowed to talk during lessons but we need to get it out, you see' (girl, school 7). Except walking, these girl groups engaged mainly in sedentary activities such as hanging out, painting, checking Facebook, Instagram or listening to music while talking. While the minority of girls sat outside on benches, climbing frames, trees, playhouses and swings, the majority of girls were indoors in the classroom, library or school cafés. Even at schools where they were not allowed to stay indoors during recess, they hid from teachers in toilets and other indoor places. These girls have similarities to the girls called 'girly-girls' in the literature (see Holland and Harpin, 2013; Paechter, 2010).

The soccer girls. A relatively large number of girls identified themselves as 'soccer girls', often joining the boys' soccer game. Girls playing ball games without boys participating were rarely seen. We only observed one soccer game and two foursquare games played solely by girls. Girls participating in boys' soccer games could, however, be separated into two distinct groups: girls who actively participated in the game and girls who participated 'passively'.

The relatively few girls who actively participated in the game knew the rules, were skilled and performed well, meaning they were fully accepted and well-regarded by the boys. These girls were called tomboys by the other girls (see also Paechter, 2010). However, most of the soccer playing girls were forced to participate 'passively' in the game. These girls were not so skilled and largely ignored by the boys which meant they were less likely to be able to improve their skills, as one girl indicated: 'When they don't kick the ball to us we never get good at it' (girl, school 15). Because the boys did not fully integrate these girls into the game, the girls moved in and out of participating

in the game by talking, checking their mobile phone or doing gymnastics or dancing when the ball was not nearby.

The dancing girls. The observed physically active games that were dominated by girls were rope skipping, playing wall (a ball game where the first child in a line throws a tennis ball at a wall, skips the ball and the next lined child catches the ball) and dancing. We categorized the girls performing these activities as the dancing girls. Predominantly we observed girls who participated in rope skipping and playing wall, but it was not uncommon for boys to join these activities from time to time. In contrast, only girls engaged in dancing. However, girls were only observed dancing at a few schools where screens were available for playing music videos or dancing games. They danced to music videos and engaged in interactive dancing games in front of these screens:

In a common room a big screen hangs on the wall showing an interactive dancing game to the rhythms of popular pop songs. In front of the screen a huge crowd of girls is imitating the dancing steps of an animated dancer on the screen. In the back right side of the crowd I am surprised to see Vicky dancing. Vicky just finished a group interview where she told me that she doesn't want to be physically active (field note excerpt, school 7).

Interestingly, girls who did not participate in other physical activities were observed participating in dancing, like Vicky in the above excerpt. Moreover, this observation reinforces that it is important to be aware that not all activities researchers would classify as PA are perceived as such by children.

The soccer boys. At all schools boys dominated the schoolyard playing soccer and only on some occasions were girls allowed to join in. As a boy articulated: 'I play soccer like all the other boys' (boy, school 17). For some boys, playing soccer during recess was the main driver to attend school as exemplified here: 'When you are at home in the morning, the motivation [for going to school] is that you might get to the soccer field. Then you really want to go to school' (boy, school 10). These boys were immersed in soccer and they hardly engaged in any other activities during recess. Most of the soccer playing boys were skilled, and play during recess was seen as an extension of their afternoon soccer club training. They embodied playing soccer; it dominated their conversations and appearance. They talked about soccer matches, wore soccer jerseys and imitated their soccer idols, as the following excerpt illustrates:

At the soccer field a match starts when I arrive. It is mostly boys playing, wearing soccer outfits. One of the boys scores a goal. He celebrates his triumph by taking his soccer jersey over his head, putting up his arms and running around the soccer field. Then he falls down at his knees and looks up at the sky for a moment (Field note excerpt, school 15).

Many of the soccer boys acted competitively and took their game very seriously, which resulted in an implicit skill-based internal hierarchy among the soccer playing boys: 'You know yourself how good you are in the rank' (boy, school 6). The most skilled players were the ones who chose the teams and controlled the game, while the less skilled players did not have adequate status to choose their own position in the field, and often found that nobody passed the ball to them.

Cole: Sometimes when we play soccer there is a first and a second selector. It's always Oscar, Kenny, Victor or Eric [mentioned as the best soccer players].

Liv: Or Jonathan.

Cole: Yes, they can select the teams and all the boys are selected except me. Then they select some of the girls [. . .]. Often when we play I am one of the last selected [. . .]. They don't pass the ball to me either [. . .] in every game I get the ball maybe once [. . .]. Because I am not very good at soccer they say I have to be goalkeeper and then if they score [a goal] they start teasing me, saying 'how bad you are' or something like that (school 15).

As shown in the excerpt, the children used 'captain-choice' to form the soccer teams. During this ritual the hierarchy becomes very explicit and visible.

The 'chasing game' boys. Engaging in different chasing games was a well-regarded activity for many boys. While at most schools a small number of boys chased each other, at a few schools almost all boys participated in chasing games. These boys had abandoned soccer either because they were tired of the fight in every recess to get the best soccer field or because they experienced these chasing games as less conflict-ridden and more inclusive of both genders since they did not see the activity as being about winning.

Michael: In third grade we were crazy about playing soccer.

Marc: We don't play soccer anymore because everybody just grabbed their lunch and ran to the soccer field waiting for the others.

Moderator: Earlier you [directed at Michael] said that you think tag is a fun game because both boys and girls play together. Why is that fun?

Michael: Because then you have the feeling that nobody is excluded (school 13).

Although girls at some schools actively participated in chasing games, these games were still dominated and controlled by boys. It was the boys who initiated the play and set out the rules.

The nerds. There was a smaller, separate group of boys called the 'nerds' (see also Francis, 2009; Mendick and Francis, 2012) who were not interested in sports and mostly avoided the soccer fields. These boys were highly inspired by a fantasy world: virtual online games or contemporary action TV cartoons. Some of these boys engaged in rough and tumble fantasy play in the bushy areas of the schoolyard. However, the majority of the boys that fall in the category 'nerd' were not interested in vigorous activities. They sat alone or in small groups and played games on computers, tablets or mobile phones during recess. Regardless of engaging in the virtual or real world, they were immersed in their games and spent most of the recess gaming. These boys were labelled as 'nerds' or 'outsiders' by others who did not have either the gadgets or knowledge of games to join this group. These boys kept to themselves and were also often declared the 'silent boys'.

Crossing gendered borders

Some girls resisted gendered play and forced boys and girls to play together by throwing themselves into games and spaces dominated by boys rather than the other way around (see also Swain, 2005; Thorne, 1993). Nonetheless, some girls expressed frustration when they participated in activities with boys. They expressed that they were bodily disadvantaged and could not physically match the more skilled, faster and stronger boys: 'Sometimes we play together, but many girls don't like the boys' rules because the girls don't want them to smash the ball and so on. It's really annoying' (girl, school 5). In spite of this, many girls liked when the gender segregation was broken up. Sometimes mixed-gender games were more practical due the limited number of ball game facilities on a school ground, but some girls also actively sought the inclusion as boys had a positive influence on the atmosphere and reduced conflicts among girls.

- Polly: Then it's actually quite nice that the boys are joining us when we play wall. They are very foolish all the time. Actually, I would like us to play more crisscross [gender mixed].
- Moderator: Why do you want that?
- Samantha: It is more fun.
- Polly: More because if girls only play with girls we almost always get mad at each other. When the boys are joining in . . .
- Samantha: . . . Then they suggest other things that are a little different than what girls would have done. Foolish things which become fun in a way we don't do it. In a way it actually becomes more fun in an odd way (school 10).

Hegemonic masculine play

Power hierarchy seemed to structure the children's self-organized play; boys controlled and dominated the majority of activities during recess and laid the foundation for children's (non) participation in vigorous activities. The physically demanding 'boys' play' generally had the most prestige among children, whether they actively or passively participated in the game. In contrast, sedentary play was either labelled as 'girls' play' or 'nerd activities' (e.g. computer gaming) and was less well-regarded or desirable. Active (soccer playing) boys often looked down on these types of play, as the following patronizing account reveals:

- Moderator: Are you looking forward to being allowed to play in the sports hall? [In fifth grade they would be allowed.]
- George: Yes, then we are just going to play soccer all the time.
- Moderator: What about you girls?
- Tessa: I don't know.

- George: It's mostly boys using the sports hall.
- Tom: They can take out some mats and sit playing with their Barbie dolls
[the boys laugh] (school 17).

This quote conveys that the boys used mocking to subordinate 'girls' play'. This performance reinforces specific gender roles and strengthens the idea of masculinity as a powerful gender (see also Huuki et al., 2010).

Moreover, boys displayed a clear hierarchical division among themselves in calling the boys who were less skilled at participating in sport games the 'nerds'. They ridiculed them for engaging in sedentary activities that resembled 'girls' play' to indicate their low status on the playground. In contrast, boys who were skilful soccer players carved out and reinforced through their behaviour that they were the 'coolest' and most popular boys. Other boys looked up to them and aspired to enter their rank because they looked superior in terms of body type and clothing.

Greig: Among the boys it is so that some are popular and then the others just follow you.

Moderator: Who are the popular boys, what are they doing?

Greig: They play soccer [...]. Scott, you are our outsider (school 2).

Because of this hegemonic boy hierarchy, the boys who were not sporty felt like outsiders. They were not good at playing soccer and could not easily chat away about the latest soccer news; they lacked the insider knowledge the 'cool' boys had:

Often in the morning before the teacher has come they sit talking about soccer: 'did you see that match yesterday?' And I can't join the conversation, you see. So I just sit getting bored, waiting for the teacher [...]. It's easier being a boy if you like playing soccer (boy, school 15).

Gendered schools

Children's play during recess was almost entirely self-organized. Although children created their own social world in the schoolyard, adults actively shaped and reinforced gender binaries during recess through their action or inaction.

According to the children, boys were sent outside by teachers more often than girls as they made more noise indoors than the girls. Even in schools where all children were required to spend recess outdoors, teachers often turned a blind eye when they discovered girls staying indoors during recess on the understanding that they engaged in quiet and non-disturbing activities.

Moreover, male and female teachers acted differently when it was their duty to monitor recess. Male teachers were mostly seen at the soccer field or in other ball game areas, whereas female teachers spent more time at the playground or near the school entrances talking to other teachers or the girl groups who were hanging out there. It rarely occurred that a monitoring teacher interacted in a game but when it happened it was usually a male teacher joining a ball game.

Halfway through recess a middle-aged male teacher comes out with his lunchbox in one hand and a glass of water in the other hand. He passes the schoolyard and walks directly down to a soccer field where a group of intermediate boys are playing soccer. The teacher sits down on a grassy rise next

to the soccer field and he addresses the boys talking about soccer. The boy asks the teacher if he wants to join the game. The teacher replies that he cannot play soccer in the shoes he is wearing; however, he gets up and walks into the soccer field and tries to score a couple of times while the boys are watching him (field note excerpt, school 6).

This field note extract shows that the boys expect the male teacher to have soccer skills and want him to prove his skills and thereby demonstrate his masculinity to them.

Finally, the layout of the schoolyard also reinforced gendered play. In general, soccer fields were the dominant play facility at most schools, favouring the boys' play. At many schools children even expressed that soccer was one of the only things to do during recess, reducing the girls' play opportunities: 'It's almost just like a soccer camp for boys' (boy, school 10).

Discussion

Other studies have emphasized the need for explicit in-depth descriptions of reasons for gender differences in children's PA level during school recess in order to provide context to existing empirical findings and inform future interventions, in particular those aimed at promoting girls' PA during recess (Broekhuizen et al., 2014; Nielsen et al., 2011; Ridgers et al., 2012). This study contributes to the current literature by exploring the cultural practices of gendered PA that shape gender specific activity patterns and social positions in the schoolyard.

According to Swain, two complementary gendered cultures sharing one school world exist (Swain, 2005). In line with Swain, we generally found contrasting activity patterns between boys and girls. The majority of boys spent time outdoors during recess engaging in physically active games. Soccer in particular was high on the priority list for boys, and these boys dominated the soccer fields. This activity had also been fostered through the layout of the school grounds. For many girls, recess activities equalled socializing through talking or 'passive' engagement in a soccer game, and as a consequence they usually did not engage in vigorous activities. The findings of our study are in line with other studies explaining the gender difference in recess PA by the fact that boys engage in more physically active types of recess activities than girls (Blatchford, 1996; Blatchford et al., 2003; Boyle et al., 2003; Nielsen et al., 2011) and that boys in general dominate the main areas of the schoolyard (Schmidt, 2009; Swain, 2000; Thorne, 1993).

The gender segregated activity pattern during recess still resembles dominant societal expectations inscribed into the heterocentric discourse of a traditionally binary gender view (Butler, 1990). Some researchers claim that children at an early age learn what it means to act as a boy or a girl, and are quick to demonstrate that they understand these roles (Laemmle, 2013). This involves early segregation between boys and girls and maintains the discourses of gender difference (Bhana, 2009). Also, schools play an important role in contributing to a traditional dichotomy between boys and girls, as we found that many monitoring teachers performed according to a traditional gender role during recess, reinforcing stereotypes. This is in line with PE studies and other school studies indicating that the attitudes and actions of teachers reflect gender stereotyping (Larsson et al., 2009; Reay, 2001; Sargent, 2013; Smith, 2007; Stidder, 2002; Waddington et al., 1998). Similar to our study, Sargent found that male teachers were under cultural pressure to perform as 'male role models' for the boys, with the result that they facilitated masculinity to boys, thereby instilling hegemonic norms of masculinity (Sargent, 2013).

However, consistent with Butler, Reay and Thorne (Butler, 1990; Reay, 2001; Thorne, 1993) we argue that it is too superficial to perceive this as a binary 'boys' world' versus 'girls' world'.

We distinguished six different gender typologies based on their different recess activities as an analytical tool to dig deeper into the gendered play: the talking girls, the soccer girls, the dancing girls, the soccer boys, the ‘chasing game’ boys, and the nerds. Based on this categorization we found some important deviations from the general gender trend: two groups ‘doing difference’ (Hey, 1997) which we would not have found if we did not differentiate in subgroups.

We found the ‘soccer girls’ who did not engage in activities categorized as typical ‘girls’ play’. They resisted gender stereotypes and labelled themselves as ‘soccer girls’. In the literature, girls are more often found to transgress borders than boys (Swain, 2005; Thorne, 1993). However, Thorne points out that the girls can only reach the status ‘with-then-apart’ in the boys’ world (Thorne, 1993), which is in line with our findings that the big group of unskilled ‘soccer girls’ felt excluded in the soccer game due to the hegemonic masculinity set up of this game (Connell and Messerschmidt, 2005; Swain, 2005; Young, 1980). However, the few skilled ‘soccer girls’, called ‘tomboys’ by the other girls, did not seem to be ‘with-then-apart’ in the boys’ world. Similar to Swain’s study, these girls felt respected by the boys (Swain, 2005), probably because they were identified with masculinity (Holland and Harpin, 2013; Paechter, 2010).

We also found a group of sedentary computer gaming boys, labelled the ‘nerds’, who felt left out because they did not fit into the masculine stereotypes (Francis, 2009; Mendick and Francis, 2012). They were not sporty and refused to act as sportsmen, which in turn led to their lower status in the schoolyard (Connell and Messerschmidt, 2005; Swain, 2003). The importance of sport abilities in shaping masculine identity has been highlighted by several authors (Connell, 1990; Dunning, 1986; McKay et al., 2000; Parker, 1996). The most esteemed and prevalent resource that boys draw on to establish status is physicality/athleticism, which is inextricably linked to the body in the form of strength, power, skill, fitness and speed (Gilbert and Gilbert, 1998). Studies have found that soccer abilities act as a key factor in constructing hegemonic masculinities in schools and represent the prestige resource in signifying successful masculinity (Smith, 2007; Swain, 2000; Swain, 2003). These findings were echoed strongly in our study and we would go further in suggesting that, in a social setting where certain popular cultural forms are more valued than others, the absence of physical (soccer) skills excludes groups of children from being popular.

A child’s choice to socially and culturally ‘do gender’ through his or her recess actions can both be encouraged and hindered because of the traditional binary gender view that is part of the heterocentric discourse (Butler, 1990). Referring to our empirical findings, the ‘nerds’ and the ‘soccer girls’, who through their constructed gender stood apart from the traditional and prevailing heterocentric norm where masculinity is related to a boy and femininity related to a girl, were for that reason excluded from play. This heterocentric discourse in the schoolyard implies that gender itself can be a barrier for children’s self-organized play during recess, and for that reason some children (i.e. the ‘soccer girls’ and the ‘nerds’) face challenges in being included in activities solely qua their gender.

Future studies

The gender differences in recess PA found in this study as well as other studies (Blatchford, 1996; Blatchford et al., 2003; Boyle et al., 2003; Nielsen et al., 2011; Ridgers et al., 2012; Schmidt, 2009; Thorne, 1993) imply that it is relevant to consider gendered aspects and structures when working towards increasing girls’ recess PA. Based on our findings it is important to notice the differences in girls’ recess activities when planning interventions to promote their PA level. More research on the specific groups is needed to recommend concrete interventions.

To further encourage the possibilities for active play in ‘the dancing girls’ and ‘the talking girls’, it is necessary to explore how the layout of schoolyards can support and inspire other activities than soccer. This is supported by other studies claiming that when more activities in the schoolyard are offered for those who do not want to play soccer the overall PA level will increase (Loucaides et al., 2009; Nielsen et al., 2011; Ridgers et al., 2007). Moreover, to ease girls’ participation in active play, providing screens to engage in dancing or providing unfixed equipment (e.g. skipping ropes, tennis balls and hopscotch stones) is recommended. Our hypothesis that girls benefit from unfixed equipment is supported by Verstraete et al., who provided unfixed equipment in schoolyards during recess and found MVPA to increase among girls (Verstraete et al., 2006).

It would also be interesting to examine the influence of teacher-organized recess activities on girls’ recess PA. Particularly the ‘soccer girls’, who want to play gender-mixed soccer but feel excluded by the boys, could possibly be more included in the game if a teacher instead of the boys is controlling the game. This claim is supported by studies which found that girls suggest teacher involvement during recess to increase PA levels (Humbert et al., 2008; Pawlowski et al., 2014). However, to make a success of teacher-organized activities, teachers have a central role to play in moving towards critical reflection on the consequences of a dual gender view and developing pedagogical spaces where social processes involved in identity formation are interrogated within gender equity (Larsson et al., 2009; Paechter, 2010; Smith, 2007; Swain, 2005).

Despite the importance of focusing on increasing girls’ PA patterns, it is also necessary to find solutions for the group of sedentary boys playing computer games. We suggest distributing spaces (e.g. hidden scrub areas) and play facilities (e.g. castles, moats and foam swords) so that they are more inclined to move their virtual play into the real world. A more controversial suggestion is reducing screen time during recess to support physical fantasy games. A recent study found that children themselves believe that screen time reduction during recess will increase recess PA (Pawlowski et al., 2014). More studies on this specific boy group are needed in the future.

Strength and limitations

The use of multiple methods strengthened the current study as it enriched the data and improved the credibility of the results. Using this combination of methods at 17 quite different elementary schools involving 58 girls and 53 boys speaks to its transferability. The consistency of findings from the children across the 17 different schools underpins that our results are prevalent throughout a variety of school environments in Denmark.

A limitation of the study was that the school visits were too short for a rapport between the children and the researcher to be formed. However, it is our impression that the children were enthusiastic about showing their schoolyard and spoke freely because the researcher was a ‘stranger’ who, through her objectivity, was an object of confidential information (Simmel, 1971). Another limitation was that there was only one go-along group interview conducted at each of the 17 schools. More go-along group interviews at each school would have enabled a more detailed description of the schools. However, our purpose was not to create deep descriptions of each school, but look across different elementary schools (Mason, 2002). The six typologies would not necessarily have been found if we had not visited multiple schools, e.g. the dancing girls only appeared at some schools that provided screens for dancing games and videos. The go-along group interviews also only included fourth graders. The perspectives of adolescents, teachers, school management and parents may differ from the children’s viewpoints. However, it was a deliberate

choice to view children as social actors in their own right and to focus on their experiences and understanding of play during recess (James and Prout, 2005).

Conclusion

Our findings of six gendered play typologies with varying behaviours, needs and power relations during recess implies that different intervention strategies might be needed to increase the PA level in different subgroups. Furthermore, to increase recess PA it is necessary to be aware of the interrelation between these six groups as lack of PA skills seems connected with social exclusion from groups playing active games due to the hegemonic masculinity set-up of active games. More detailed research into what is required for in particular the least active groups is needed to successfully increase both the girls' and overall PA levels.

Funding

The study is supported by The Danish Cancer Society. The Activating Schoolyards Study is part of the Centre for Intervention Research in Health Promotion and Disease Prevention.

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Peer mediators, School 5 – Kilde: Charlotte Skau Pawlowski

Promotion of physical activity among children: can we learn from New Zealand recess practices?

INTRODUCTION

Current scientific evidence supports the conclusion that regular physical activity (PA) provides fundamental health benefits for children (Lubans et al., 2010; Tobias et al., 2007; Rethon et al., 2010; Andersen et al., 2006). As a consequence, the World Health Organization (WHO) recommends that children should accumulate at least 60 minutes of moderate-to-vigorous physical activity (MVPA) daily (Currie et al., 2012). The latest national survey indicates that only 26% and 39% of Danish (DK) girls and boys aged 11 years, respectively, adhere to these global guidelines (Rasmussen et al., 2015). Daily MVPA is significantly higher among 10-14-year-old New Zealand (NZ) children; approximately two-thirds of NZ children comply with the WHO guidelines (75% of girls and 86% of boys, respectively) (Clinical Trials Research Unit, 2010). Furthermore, Nielsen et al. objectively measured children's PA during school hours in both DK and NZ, with NZ children being much more physically active in this setting (Nielsen et al., 2012; Nielsen et al., 2010). While the studies used different types of accelerometers, measurement inconsistencies are unlikely to explain the more than 5-fold greater MVPA during school hours in NZ compared to DK.

A growing body of research suggests that PA initiatives based in the school setting can be effective due to the large proportion of time children spent at school (Broekhuizen et al., 2014; Dobbins et al., 2013; Cook et al., 2013). School recess, in particular, provides one of the largest contributions to children's overall level of PA (Nielsen et al., 2011; Ridgers et al., 2006). DK studies have found that movement policy, the physical setting, and staff engagement are important factors for duration, frequency, and intensity of recess PA (Toftager et al., 2014; Paw-

lowski et al., 2014b; Troelsen et al., 2014). Because of the significant difference in PA between DK and NZ children, we found it important to explore NZ schools' recess practices for possible inspiration.

The aim of this study was to identify potential PA-promoting recess practices at NZ schools that could be transferrable to DK schools. The DK schools ongoing implementation of a new school reform, focusing on creating more PA, provides excellent opportunities to discuss how recess in DK schools might be redefined to increase the levels of PA.

METHOD

Context

In NZ, most primary schools contain students in grades 1-6 (5-12 years old), whereas few schools include some intermediate students at the same site (grades 7-8, 13-14 years old). Students attend school approximately 30 hours per week, and the curriculum includes health and physical education (HPE). HPE is compulsory for all schools up to grade 10, which includes foci on the development of motor skills through movement, the acquisition of knowledge and understanding about movement, and the development of positive attitudes towards PA (Ministry of Education, 1999). A minimum of 60 minutes is dedicated to recess per day, distributed over two breaks: morning tea and lunch. Lunch break is the longest break, lasting 30-60 minutes.

Design and setting

The current study was conducted as an ethnographic field study using participant observations and informal field talks with children and school workers (e.g., principals, teachers and secretarial staff). These methods were chosen to gain insight into the recess practices and the children's



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actions and experiences during recess (Spradley, 1980; Rubow, 2003). The study was carried out in February and March 2014 (late NZ summer) in five public primary schools in the Waitakere region of Auckland, NZ. People of many different

nationalities, typically lower to middle class, inhabit the area. The schools differed in background variables but were more or less homogeneous in their recess practice (Table 1).

Table 1. Main characteristic of the five NZ schools in the study

SCHOOL NO.	SCHOOL 1	SCHOOL 2	SCHOOL 3	SCHOOL 4	SCHOOL 5
<i>Background variables*</i>					
Grade	1-6	1-8	1-6	1-6	1-8
Enrolled students	686	455	373	375	499
Decile**	6	7	4	5	5
Ethnicity	NZ Euro. 50 % Maori 11 % Pacific 9 % Asian 26 % Other 2 %	NZ Euro. 60 % Maori 14 % Pacific 8 % Asian 16 % Other 2 %	NZ Euro. 26 % Maori 16 % Pacific 33 % Asian 15 % Other 10 %	NZ Euro. 35 % Maori 21 % Pacific 25 % Asian 7 % Other 7 %	NZ Euro. 48 % Maori 24 % Pacific 14 % Asian 7 % Other 7 %
<i>Recess practice</i>					
Outdoor policy	Yes	Yes	Yes	Yes	Teacher decision
Electronic devices	No	No	No	No	Yes
Recess periods + duration (min.)	MT: 15 LB: 50	MT: 25 LB: 35	MT: 20 LB: 50	MT: 25 LB: 60	MT: 30 LB: 30
Duty teachers per recess	5	4	4	6	2
Organized sport	Yes	Yes	Yes	Yes	Yes
Play-initiating student duties	Yes	No	No	Yes	Yes

* Data from Education Counts, Ministry of Education, NZ

** Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities, whereas decile 10 schools are the 10% of schools with the lowest proportion of these students.
MT=Morning tea time, LB=Lunch break.

All five schools were recruited to the current study through an existing schoolyard intervention study: The PLAY study. The PLAY study aimed to increase PA and reduce weight gain in NZ school children by expanding the number of permanent schoolyard play facilities. The interventions did not include organizational initiatives, which was highlighted in current study.

Participants

All children attending the five schools participated in current study, comprising a study population aged 5-12 years (grades 1-6) at three schools and 5-14 years at two schools (grades 1-8) (Table 1). Most of the children were NZ European, but a relatively high percentage was Maori, Pacific Island, Asian or from other countries (Table 1). School principals, monitoring teachers and reception workers at the five schools were approached if clarifications were needed in regard to recess practices and actions.

Data collection

The study included one visit at each of the five schools lasting for three consecutive school days, spread out over all weekdays to provide an opportunity to follow children on different schooldays (i.e. 15 days in total). Participant observations took place during the two daily recess periods – morning tea and lunch – and were conducted by the lead author (from DK) and a NZ research assistant. The two observers frequently changed the settings for observation between classrooms, sports halls, swimming pools, libraries, field areas, scrub areas and playgrounds. Observations were documented with field notes and photos (Emerson et al., 2011). The study was approved by Auckland University of Technology Ethics Committee (AUTEC: 10/95).

Analysis

A thematic analysis (Neergaard et al., 2009; Sandelowski, 2000) was used to code field notes and photos thematically with the explicit purpose of identifying recess practices in NZ schools that appeared PA-enhancing and might be transferable to a DK context without implementation costs. This implied that we omitted a closer analysis of practices related to the climatic conditions and built environment (e.g., school buildings, play facilities and space). At first, phrases from field notes that referred to recess practice were highlighted and grouped from each school. Then themes were developed through a cross-sectional coding and re-coding process, in order to identify commonalities and differences between the schools (Mason, 2002).

RESULTS

The results are presented in six sections in accordance with the thematic analysis. In each section field note extracts or photos are used to illustrate key themes identified in the data.

Outdoor play

At four schools children were required to be outside during recess all year round (Table 1), and children were not allowed to leave the school during recess at any school. The children ate a packed lunch outdoors before morning teatime and lunch break, such that they were already outdoors when the recess started.

The bell rings once and all children walk or run out from their classroom carrying their lunchboxes. They sit down at the porch floor eating their packed lunch. Some of the kids sit clasping balls, skipping ropes and hula-hoops while eating. Ten minutes later the

bell rings again and most of the children quickly pack away their lunch boxes and run down from the porch and out in the schoolyard or down to the field (field note excerpt, School 1).

When asking the children if they would rather stay indoors during recess, most children explained that they preferred to stay outdoors because there were more things to do outside. Some children also stated that they could not imagine being indoors during recess because they had never tried this except during inclement weather.

At School 5, the class teacher had the responsibility to decide if the children should stay outdoors or indoors during recess. Nevertheless, at this school most of the classrooms were empty during recess and some were even locked.

No electronic devices

At four schools electronic devices (e.g., mobile phones and tablets) were not permitted during recess. At two of these schools children had limited access to computers during recess on a couple of schooldays, either at the library or in a computer room supervised by a teacher. The principal from School 1 explained that he did not allow the children to bring electronic devices because he found the devices anti-social and preferred children to be physically active in the playground. At one school the children were allowed to use their own electronic devices during recess (Table 1). However, very few children used these electronic devices.

I [the lead author red.] talk to a group of five older girls who are telling me that they are allowed to use mobile phones during recess. I look surprisingly around the school-

yard where I cannot see any children using mobile phones (field note excerpt, School 5).

Many children told that they did not have a mobile phone or tablet, and some children said that their parents not allowed them to bring their electronic devices to school because the electronic device could break or disappear.

Long lunch break

Three of the schools had a lunch break lasting 50 to 60 minutes (Table 1). According to the observations and teacher statements the children seemed to be engaged in PA for the whole lunch break at these schools.

The field is crowded with biking and running children until a few minutes before the bell rings where it seems as if the number of children at the field decreases. I [the lead author red.] comment on this to a passing duty teacher who responds that the children always are exhausted after lunch break because they have been playing actively almost an hour (field note excerpt, School 1).

At these three schools teachers explained that a long lunch break allowed organized activities and to open up alternative facilities for free play such as the sports hall and swimming pool. In particular, we observed that the outdoor swimming pools were popular for free play during the lunch break.

Present duty teachers

At four schools 4-6 duty teachers were present in the outdoor areas during recess (Table 1). Duty teachers were in general visible wearing yellow or orange waistcoats. The principal from School 1 explained that the children felt safer if adult pre-

sence was visible and they quickly could spot a teacher if help was needed. Some teachers passively observed the children waiting for the children to reach-out for help, or they walked around enforcing the rules. However, most teachers were interacted with the children by talking and playing.

One by one four duty teachers enter the schoolyard. They are all wearing a yellow waistcoat and a first aid bag. Several children run to the teachers, as they need help to solve conflicts. Occasionally, two male teachers interact with the boys' soccer or rugby play.

It is clear to see that the boys want the two male teachers to play with them; they kick the ball to the teachers and wait for them to kick it back (reminds me of dogs wanting their owners to throw a stick). Particular one of the male teachers seems very popular. He is talking to all the children he passes and has a large group of children walking with him. One of the children is carrying his first aid bag. Later the teacher finds a guitar and plays a couple of songs and even more children gather around him. When the bell rings, one of the female teachers stays in the



Student duty as play equipment lender, School 4 - kilde: Charlotte Skau Pawlowski

schoolyard until all children have left (field note excerpt, School 4).

Organized sport activities

At all schools children were given the opportunity to participate in organized sport during recess such as netball, softball, rugby, cricket, cheerleading and soccer (Table 1). At some schools children enrolled in a sport at the beginning of the school year and practiced several times a week during recess and participated in tournaments during the weekends. At other schools children could participate in different organized sport activities from day-to-day. Organized sport typically lasted for 30 minutes during lunch break and was organized by teachers.

A sporty dressed male teacher walks directly from the staff room to a boy sitting in a climbing frame. He says to the boy, “fun game is going on if you wanna come” and walks down to a corner of the field where approximately 15 children are playing softball. He assists a female teacher who acts as referee. She often blows her whistle, which she wears around her neck, and she registers goals using a notepad lying in the grass. Once she stops the game and gives the children technical play instructions. Approximately 20 boys and girls arrive to another corner of the field and sit down in a circle in the grass. A female teacher arrives and changes her shoes to running shoes while she makes two teams. The teacher blows her whistle to start a game similar to American football. Half way through recess the teachers stop the two games and some of the children carry the used play equipment back to the sports equipment shed (field note excerpt, School 3).

The principals explained that the reason that they offered organized sport during recess was to create equal possibilities to attend sport activities because many parents could not afford after school sport. Moreover, they explained that some children were not very skilled in self-organizing play for longer periods of time, which resulted in many conflicts during recess.

Students on play-initiating duties

At all schools older students had recess duties such as library monitors, office duty, garbage collectors, peer mediators and play equipment lenders. The peer mediator and the lender of play equipment functions helped initiate play. The peer mediator function was practiced at School 5. Older students were trained to be peer mediators during recess on a voluntary basis, helping duty teachers in solving conflicts and seeking out play relations for children who had difficulties in being included in play. Schools 1, 4 and 5 had a shed in the schoolyard filled with play equipment (e.g., balls, hula-hoops, skipping robes, hockey- and cricket gear). At these schools the lending of play equipment during lunch break was organized by a group of older students who rotated their duty.

The bell rings once and four girls go directly to the sports shed. In front of the shed they place a big “No entry” sign and two rows of cones indicating a line. In the shed they place a table in the opening, and rearrange some of the play equipment until the bell rings again. They remove the sign and sit down at the table. Students are lining up, waiting to get equipment and the girls are busy writing down the students’ names, classrooms and what they are borrowing.

When students hand back the equipment they get ticked off the lending list. At the end of the lunch break three of the girls go around the schoolyard each carrying a bag. They search for equipment not handed back and when they find equipment they carefully tick it off from the list (Field note excerpt, School 4).

All duty students took their responsibilities seriously and the system seemed to work well at the schools with help from a coordinating teacher.

DISCUSSION

NZ children are more physically active during the school day than DK children (Nielsen et al., 2012; Nielsen et al., 2010). As school recess is a large contributor to children's overall level of physical activity (Nielsen et al., 2011; Ridgers et al., 2006), the aim of this study was to describe possible PA-promoting recess practices at five NZ schools. Six NZ recess practices with possible PA-promotion were described: outdoor policy, no electronic devices allowed, long breaks, presence of duty teachers, organized sport activities, and play-initiating student duties. In the following discussion we will compare the NZ recess practice with DK practice and experiences in the effort to promote PA during DK school recess. It should be noted that the suggested interventions below should be seen in the light of a health discourse aiming to improve public health.

Recess policies to enhance PA

WHO emphasizes the importance of policies to encourage healthy behavior in schools (World Health Organization, 1998). Additionally, Haug et al. found school policies to increase PA in Norwegian schools (Haug et al., 2010), but in DK

it is rare to find school regulations that describe how recess should be organized. Although children are found to be more physically active outdoors than indoors during recess (Dessing et al., 2013), a 'stay outdoors during recess' policy is mostly exclusive to the 1-3 graders in DK. This had led to older students perceiving it to be a privilege to be exempted from this rule, as it is essentially an indicator that they are no longer considered a small child (Troelsen et al., 2014). A DK multicomponent school intervention study, SPACE, implemented an outdoor policy for 6-8 graders at seven schools. At first, the students' responses were mostly negative, resulting in conflicts between duty teachers and students trying to hide indoors. However, the resistance was reduced in the second year of the intervention (Troelsen et al., 2014). Introducing an outdoor policy in DK requires sustained effort given the challenges associated with engaging the oldest students. Nonetheless, an outdoor policy may be acceptable if implemented in conjunction with an ongoing PA-related discourse involving students in the decision-making processes (Troelsen et al., 2014).

On a policy level it is also necessary to respond to the common use of electronic devices during recess in DK schools. A study found that electronic devices during recess was allowed and widely used at 16 out of 17 studied DK schools (Pawlowski et al., 2014b). The need for regulation of smartphone and tablet use is a relatively new issue schools have to face; even DK children voice their discontent with the devices obstructing social interaction and play (Pawlowski et al., 2014b). We suggest that a policy at school level to reduce the use of electronic devices during recess would promote greater engagement in recess PA, similar to most of the NZ schools in our study.

PA promoting recess organization

Organization of recess plays a crucial role to increase PA (Pawlowski et al., 2014b; Troelsen et al., 2014; Toftager et al., 2014). In line with our findings, other studies have found that the longer the recess duration, the more children engage in PA (Ridgers et al., 2007; Parrish et al., 2012). These findings support the introduction of fewer but prolonged recess periods per day in DK schools, similar to the majority of NZ schools in current study. A prolonged break also facilitates the implementation of organized activities and use of alternative facilities such as sports halls and swimming pools.

Additionally, several studies have found that a

lack of teacher supervision during recess is a barrier for recess PA (Pawlowski et al., 2014b; Parrish et al., 2012; Stanley et al., 2012). We found more duty teachers were present during recess in NZ schools than generally seen in DK schools (Pawlowski et al., 2014b). Lack of teacher presence in outdoor areas appears to be related to conflicts (Willenberg et al., 2010; Sallis et al., 2001), hence increased teacher supervision in DK schools could result in faster conflict resolution leading to increased PA.

It is evident that recess in NZ schools is much more adult-regulated compared to DK schools. A clear difference between DK and NZ recess is the teacher organized sport activities. A study



Teacher controlled play, school 2 – kilde: Charlotte Skau Pawlowski

found that trained teachers initiating recess activities increased MVPA especially in overweight children (Huberty et al., 2011). In DK schools a long pedagogical tradition has given preference to children's free play and self-directed activities (Ministry of Education, 1960). As a result many feel bored and choose to stay indoors doing sedentary activities (Pawlowski et al., 2014b), or they feel excluded from play (Pawlowski et al., 2014a). The DK SPACE study successfully implemented Kick-starters: teachers educated to initiate a wide variety of recess activities for 6-8 graders (Troelsen et al., 2014; Toftager et al., 2014). Similar to our NZ findings, the teacher-initiated competitions and tournaments appeared to increase recess PA among the older DK children (Mikkelsen, 2014).

Another way to develop more organized activities during recess is stimulating activities initiated by older students. In DK, The Play Patrol (Legepatruljen) is a successful organized play initiative by trained older students increasing younger children's recess PA (Søndergaard, 2013). A similar initiative, GameBoosters, targets 4-6 graders and has been tested at some DK schools. Like The Play Patrol it is a promising initiative with professional support for student education and further training (Dansk Skoleidræt, 2015). However, to further increase recess PA in DK schools, assigning students to duties such as the coordination of play equipment lending is likely to be worthwhile. Several studies have found a relation between the amount of unfixed play equipment and PA during recess (Ridgers et al., 2012; Verstraete et al., 2006; Farley et al., 2008; Willenberg et al., 2010). The play equipment lending system controlled by students will expand the variety of play facilities in the DK schoolyards, which at present may not be sufficient (Pawlowski et al., 2014b).

CONCLUSION

NZ children are more physically active during their school day than DK children. NZ school recess practices were observed in detail using a qualitative approach. Six NZ recess practices with possible PA-promotion emerged: outdoor policy, no electronic devices allowed, long breaks, presence of duty teachers, organized sport activities, and play-initiating student duties. In the light of a health discourse aiming to improve public health, DK schools could further support their students' PA by learning from the recess practices observed in NZ schools. On the basis of our findings we suggest that DK schools should initiate more PA-promoting recess initiatives at a policy and organizational level, as these initiatives are relatively simple and cost-effective, yet have the potential to yield important health benefits. The ongoing DK school reform, focusing on creating more PA, provides excellent opportunities to discuss and implement recess changes.

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RESEARCH ARTICLE

Children's Physical Activity Behavior during School Recess: A Pilot Study Using GPS, Accelerometer, Participant Observation, and Go-Along Interview

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Citation: Pawlowski CS, Andersen HB, Troelsen J, Schipperijn J (2016) Children's Physical Activity Behavior during School Recess: A Pilot Study Using GPS, Accelerometer, Participant Observation, and Go-Along Interview. PLoS ONE 11(2): e0148786. doi:10.1371/journal.pone.0148786

Editor: Alejandro Lucia, Universidad Europea de Madrid, SPAIN

Received: July 30, 2015

Accepted: January 22, 2016

Published: February 9, 2016

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Data Availability Statement: Our dataset includes GPS data, which is identifiable and cannot be shared publicly. Furthermore, our respondents and their parents were not asked to consent to data-sharing outside of our research group. A desensitized aggregated dataset can be requested by contacting the primary investigator of the study, Associate Professor Jasper Schipperijn at jschipperijn@health.sdu.dk.

Funding: This study was funded by The Danish Cancer Society.

Abstract

Schoolyards are recognized as important settings for physical activity interventions during recess. However, varying results have been reported. This pilot study was conducted to gain in-depth knowledge of children's physical activity behavior during recess using a mixed-methods approach combining quantitative GPS and accelerometer measurements with qualitative go-along group interviews and participant observations. Data were collected during three weekdays in a public school in Denmark. Eighty-one children (47 girls) wore an accelerometer (ActiGraph GT3X) and GPS (QStarz BT-Q1000xt), sixteen children participated in go-along group interviews, and recess behavior was observed using an ethnographical participant observation approach. All data were analyzed separated systematically answering the Five W Questions. Children were categorized into Low, Middle and High physical activity groups and these groups were predominantly staying in three different locations during recess: school building, schoolyard and field, respectively. Mostly girls were in the building remaining in there because of a perceived lack of attractive outdoor play facilities. The children in the schoolyard were predominantly girls who preferred the schoolyard over the field to avoid the competitive soccer games on the field whereas boys dominated the field playing soccer. Using a mixed-methods approach to investigate children's physical activity behavior during recess helped gain in-depth knowledge that can aid development of future interventions in the school environment.

Competing Interests: The authors have declared that no competing interests exist.

Introduction

The physical, mental, and social health benefits of physical activity (PA) in children are well documented [1, 2]. Despite the benefits of PA, a significant number of children in Denmark and other Western countries do not reach recommended levels of PA [3, 4].

As recess PA has been reported to contribute with up to 40% of children's recommended daily PA [5], the physical environment of the school has long been recognized as an effective setting for PA initiatives, particularly schoolyards during recess [6, 7]. However, PA behavior during recess can vary widely depending on schoolyard space [8–11], facilities [12, 13], gender [14, 15] and social grouping [16, 17]. Moreover, studies in school-based PA interventions have reported varying results concluding that an in-depth exploration of children's PA behavior during recess is needed [6, 18–22].

To grasp the complexity in PA behavior in schoolyards the current study builds on a dual-process view on the environment–behavior relationship conceptualized in a model by Kremers et al. and modified by Troelsen positing that PA behavior is influenced of conscious and unconscious processes related to the environment [23, 24].

PA levels and behavior during recess have been measured primarily using quantitative measurements such as accelerometers or self-reported data in previous studies [6, 25–28]. When assessing location and intensity of play behavior in schoolyard environments the majority of studies have used the System for Observing Play and Leisure Activity in Youth (SOPLAY) [29–33]. Some studies are based on a combination of quantitative methods (heart rate or accelerometer combined with GPS) to objectively describe children's PA behavior and location during recess [15, 34–36]. Two other quantitative techniques have been used to examine children's recess behavior. The System for Observing Children's Activity and Relationships during Play (SOCARP) providing information on children's behavior and social interactions [9] and a write and draw technique to examine what children like and dislike about recess [37]. To get an understanding of children's behavior, social interaction and perceived PA during recess other studies have used qualitative-phenomenological approaches such as different interview techniques [8, 10, 16, 38] and ethnographical observation approaches [16, 39–41]. To our knowledge only two studies on PA behavior during recess have used a mixed methods approach combining SOPLAY with focus group interviews [42] and systematic observations with questionnaires [43], respectively.

Each research method has its advantages and limitations in exploring children's PA behavior during recess. However, none of the previous studies exploring children's recess PA behavior have systematically combined objective measurements such as GPS and accelerometer with qualitative methods. A mixed methods approach has the potential to provide an in-depth knowledge of children's PA behavior [44]. Providing a more complete picture of children's PA behavior during recess can further qualify e.g., intervention studies and natural experiments as it is when behaviors and the environment are understood that effective interventions can be designed [23, 45].

The aim of this study was to gain in-depth knowledge of children's PA behavior during recess by pilot testing a mixed-methods approach combining the quantitative measurements GPS and accelerometer with qualitative go-along group interviews and participant observations.

Method

Setting

This study was carried out at a public school in a rural lower middle class area in the western part of Denmark. 381 students were enrolled at the school divided into junior (grade 0–3),

middle (grade 4–6) and senior (grade 7–9) tiers. Almost all students were ethnic Danes (99%). Our target group consisted of the middle tier students (grade 4–6; 10–13 years-old) in order to get a better understanding of PA behavior among an age group that is known to significantly decrease their PA [46].

The school grounds covered 13,311 square meter (35 square meters per child) and were separated in a paved schoolyard with play markings, a large grass area with soccer fields and a well-equipped playground for junior students only. During the school day there were three breaks all included in our study; morning tea and lunch break lasting 30 minutes each, and a 10 minutes afternoon break. All breaks were characterized by free play supervised by teachers. The junior students must stay outdoors during recess but the school had no outdoor recess policy for middle and senior tier students. Classrooms, corridors, a library and a canteen were the indoor areas allowed to be used by middle and senior tier students during recess.

The school was recruited to the current study as part of the baseline study of a schoolyard intervention study: The Activating Schoolyards Study [47]. This study aims to get knowledge about how to improve children's opportunities to become physically active in the schoolyard during recess, in particular the least physically active schoolchildren. The current study was conducted prior to the implementation of the schoolyard intervention. The school is similar to many other Danish schools in terms of the type of school buildings, size, recess organization, characteristics of school grounds, and number of students enrolled [8].

Recruitment

Eighty-five (48 girls) out of 115 children attending the middle tier agreed to participate in the study by wearing accelerometer and GPS. Three go-along group interviews (one for each middle tier grade level) were conducted. Participants were purposely sampled with help from a designated middle tier teacher who was able to recruit children from the middle tier classes with diverse characteristics to ensure variation in gender, social backgrounds and PA level to allow for contrasting opinions. This approach was employed to ensure both homogeneity and heterogeneity within the groups [48, 49]. In total 16 children (eight girls) participated in the go-along group interviews. The group-size ranged from four to six participants (six participants in the interview with grade 4 and 5 children and four participants in the interview with grade 6 children). Group interviews with four to six participants are recommendable if the study is to gain in-depth insight of people's experiences. Also, smaller groups are preferable when the participants have a great deal to share about the topic or have had intense or lengthy experiences with the topic of discussion [48, 49].

Ethical approval. All parents of the participating children provided a written informed consent on behalf of the children, and all children could withdraw from the study at any time. Parents of the 16 children participating in go-along group interviews provided and additional written informed consent for the interview. Data were collected in accordance with the Helsinki declaration and this type of consent procedure has been found to be ethically appropriate in low-risk research in children at the age group enrolled in our study [50]. According to the Danish National Committee on Health Research Ethics formal ethical approval was not required as the project was not a biomedical research project. The study and its data-management procedures have been approved by the Danish Data Protection Agency (2013-41-1900 and 2014-41-2801).

Data collection and measurements

All data were collected during three schooldays in June 2014. The study used four different data collection methods and measures with specific aims in relation to explore the children's PA behavior, as described in more detail below.

Accelerometer and GPS. Objective PA data were recorded as an activity-count every 15 seconds using the ActiGraph accelerometer model GT3X to explore differences in PA intensity between grade, gender and recess periods [51, 52]. We did not use the low frequency extension (LFE) option during data collection.

The children's locations during recess were measured every 15 seconds using QStarz BT-Q1000xt GPS trackers [53]. The schoolyard was mapped in detail using the Geographic Information System (GIS) software ArcGIS 10.3 and the total outdoor area at the school was calculated.

The children were asked to wear the accelerometer and GPS in an adjustable elastic belt on their waist during the data collection period. Verbal and written instructions on how to wear the equipment were given to the children by the research team. The equipment was not worn overnight and during water-based activities. To increase compliance the children received short reminder text-messages on their mobile phones twice a day.

Participant observation. Participant observation, an ethnographical observation approach [54], was used to gain insight in children's PA behavior during recess by exploring types of activities and interactions at different locations and recess periods. The observations were conducted during recess on three weekdays where the children wore accelerometer and GPS.

The participant observations were focused on the middle tier students (grade 4–6) wearing accelerometer and GPS by following these children around in different outdoor and indoor areas. The observations were driven by an open approach to the explored field [55]. This led to observations of both specific activities and specific groups of children. The observer either participated actively in the children's activities, or passively observed the children from a distance. The researcher's position was adapted to fit the situation [54]. Observations were documented with field notes and photos [56].

Go-along group interview. We conducted group interviews with the selected children to explore the children's subjective perceptions and attitudes to their PA behavior during recess [57, 58]. To facilitate the conversation and evoke memories the interviews were carried out walking around in the schoolyard inspired by a go-along interview approach [59, 60].

The tree go-along group interviews were conducted during lessons. The go-along group interviews lasted for approximately 60 minutes. Prompts during the walk included for example: 'What do you do during recess?' 'With whom are you doing it?' 'Where are you doing it?' 'When are you doing it?' 'Why are you doing it?' The go-along group interviews were filmed using an iPad mini2® to record both verbal and nonverbal interaction of the children.

Analysis

The quantitative and qualitative data were analyzed separately. In all analyses we systematically used the Five W Questions as an underlying analytical tool to reveal a more complete story on PA behavior during school recess (Who did that? What happened? When did it take place? Where did it take place? And Why did that happen?) [61]. 'Where' the children were during recess was used to drive the first step in both data analysis.

Quantitative analysis. At the end of the data collection period the accelerometer and GPA data were downloaded using ActiLife v.6.11.4 and GPS data logger software BT747 (www.bt747.org), respectively. All accelerometer and GPS files were processed using the Personal Activity and Location Measurement System (PALMS, <https://ucsd-palms-project.wikispaces.com>) to match the two types of data based on their timestamp and calculate wear time and PA. The Evenson cutpoints, which have been recommended to estimate PA intensities among children, were used to classify moderate-to-vigorous physical activity (MVPA) [62, 63].

Continuous periods of 60 min of zero values were classified as accelerometer non-wear time, and were removed from the data [64]. The combined data were then downloaded into a PostgreSQL database and combined with data from class timetables and schoolyard GIS data. In the database, school time was selected for each participant based on the class timetables.

Eighty-one children (47 girls) with combined accelerometer and GPS data during all recess periods on the three days of data collection were included in the analysis. For each recess period we ran a 'hot-spot analysis' in ArcGIS 10.2 in order to find locations that were important for activity. The 'hot-spot analysis' tool was used to calculate the Getis-Ord G_i^* statistic [65] for the activity count values of each GPS-point. This tool works by looking at each feature within the context of neighboring features. A point with a high activity count value is interesting but may not be a statistically significant hot spot. To be a statistically significant hot-spot, a point will have a high activity count value and be surrounded by other points with high activity count values.

Based on mean MVPA per child during recess three activity groups were created. The Low PA group represents children within the lowest activity quartile, the Middle PA group consisted of children in the middle two quartiles and children in the highest quartile were grouped in the High PA group.

The statistical analyses were performed using STATA SE13. To describe time and PA level per area type (defined by the hot-spot analysis) descriptive statistics were calculated using median and interquartile ranges (IQR) for each activity group, as these variables were not normally distributed.

Qualitative analysis. To ensure consistency, the first author transcribed all observation field notes and interviews. Then field notes, photos, and interview transcripts were coded to identify different locations for children's recess PA. Afterwards we analyzed the PA behavior in each of the locations by answering Who, What, When and Why questions to create a deeper understanding of the data. Using a thematic analysis, building on a coding and re-coding process based on similarities and variations in the material, a set of analytical categories emerged [66]. In the presentation of the results children were anonymized by using pseudonyms.

Results

In total 81 participants were included in the analyses and 22 (15 girls) belonged to the lowest activity quartile (Low), 38 (30 girls) to the middle two quartiles (Middle) and 21 (2 girls) to the highest quartile (High) based on minutes spent in MVPA during recess. The median time spent in MVPA during recess was 2.8, 8.3 and 19.9 minutes for the Low, Middle and High PA group, respectively. During the whole school day the median time spent in MVPA was 54.0 minutes, 75.6 minutes and 87.0 minutes respectively.

Based on both analyses three main locations could be distinguished: building (i.e., the entire indoor school area), schoolyard and field. The building was a cold-spot (low activity spot), the schoolyard had both cold-spots, e.g., a skate-board ramp and balancing bars used as hang-out area, as well as hot-spots (high activity spots), e.g., a foursquare area, and the field was a hot-spot (Fig 1).

All children spent at least some time in the building, 79 out of 81 children visited the schoolyard during recess and 51 children visited the field. A more specific analysis of the three locations will be presented below.

Building

All children spend some of their recess time in the building, but the median time spent varied between the three groups. Children in the Low PA group spent most time in the building with



Fig 1. An example of where the Low, Middle and High PA groups were during recess. Contains data from the Danish Geodata Agency, Ortofoto, WMS.

doi:10.1371/journal.pone.0148786.g001

a median of 44.1 minutes. The Middle PA group spent a median of 24.2 minutes there and children belonging to the High PA group spent a median of 12.5 minutes inside (Table 1).

According to the observations we mostly found the children staying in four different zones in the school building: classrooms, corridors, canteen and library. Based on observation and the ‘hot-spot’ analysis these areas seemed to appeal to sedentary activity. The classrooms were small and packed with desks and chairs and the corridors were narrow but had some couches and small niches with tables and chairs. In the library and canteen the children were only allowed to sit down quietly during recess.

The median time spent sedentary in the building was 27.0, 14.1 and 6.3 minutes for the Low, Middle and High PA group, respectively. In contrast, time spent in MVPA was low for all three groups with 1.2, 1.9 and 2.3 minutes respectively.

When the bell rang we observed that a few boys and girls remained seated quietly in their classroom and became absorbed in their own sedentary activity during the whole recess. The boys typically started playing computer games whereas the girls started reading books or began painting. However, most of the children indoors were girls socializing with their classmates in smaller groups by talking, playing cards or walking around.

Based on the interviews, most of the children staying indoors expressed that they did not stay indoors because they were attracted to the indoor area as a place, but because they felt a lack of motivating outdoor play facilities. Many girls often felt bored and hung around indoors because they did not know what to do during recess, as exemplified below:

Moderator: Do you arrange things to do during recess?

Maya: No, I just sit indoors with my girlfriends. We just sit indoors talking because there is not so much to do outdoors.

Andy: You fool around, throw food and yell.

Moderator: Are you happy doing this or do you prefer doing something else?

Table 1. Characteristics of time spent, activity level and behavior in the building during recess.

Building	Quantitative			Qualitative
Who	Low n = 22 (15 girls)	Middle n = 38 (30 girls)	High n = 21 (2 girls)	Few boys and a predominance of girls.
What MVPA lightSed	Median (IQR) 1.2 (0–2.8) 9.3 (0.8–22.7) 27.0 (3.3–41.9)	Median (IQR) 1.9 (0.3–4.3) 8.7 (3.4–19.9) 14.1 (1.4–27.4)	Median (IQR) 2.3 (0.8–4.1) 4.2 (0.9–8.5) 6.3 (0.8–11.1)	Sedentary activities such as playing computer games, mobile phone or cards, reading books, painting and hanging around talking.
When Time	Median (IQR) 44.1 (4.5–51.9)	Median (IQR) 24.2 (7.3–41.5)	Median (IQR) 12.5 (5–21.9)	Was used during all recess periods.
Where	Most of the indoor staying children were in the area for middle tier students including classrooms, corridors and a canteen			Classrooms, corridors, canteen and library.
Why				Most preferred to stay outdoors but stayed indoors because they experienced a lack of outdoor facilities appealing to them.

Median, IQR and Time all in minutes Low, children in the lowest activity quartile; Middle, children in the middle two activity quartiles; High, children in the highest activity quartile. Activity quartiles are generated based on mean physical activity during recess. IQR, Inter Quartile Range; MVPA, Moderate to Vigorous Physical Activity; Light, Light activity; Sed, Sedentary activity

doi:10.1371/journal.pone.0148786.t001

Maya: Well, there is not really anything to do during recess and if we go outdoors you can only play soccer. But sometimes we take a quick walk in the schoolyard and then we walk back to our classroom again to sit down talking.

Many children expressed that if there were more different play facilities in the schoolyard they would prefer to do activities outdoors during recess.

Schoolyard

The schoolyard was an asphalt-paved square enclosed by school buildings. In the northern part, the square consisted of a zone with two marked foursquare pitches. In the middle of the square a basketball zone, a small multi court, and a picnic table were placed. The southern part of the schoolyard consisted of a small area with gravel, big stones and balancing bars, two small marked soccer pitches, and a ramp for skateboarding.

Almost all children spent some time in the schoolyard with a median of 7.0 minutes for the Low PA group, 16.4 minutes for the Middle PA group, and 3.1 minutes for the High PA group. The median time spent in MVPA was 0.8, 3.6 and 0.5 minutes for the three groups, respectively. The children, predominantly girls, in the Middle PA group that spent most time in the schoolyard spent a median of 7.8 minutes in light activity and 4.1 minutes sedentary. Many of these girls were only in the schoolyard for a short period of time, walking in and out of the building. They explained that they primarily used the schoolyard because it was the easiest outdoor area to reach from their respective classrooms. During the short afternoon break also many boys were in the schoolyard because the break was too short (10 minutes) to get to the field and start-up a soccer game ([Table 2](#)).

'Waiting' was a frequent activity in the schoolyard. The basketball hoops were used by a group of girls who were shooting hoops one at a time while the others were waiting their turn at the picnic table. Furthermore, foursquare games were a popular activity in the schoolyard, but since only four children could actively participate at one time, many children were waiting in line for their turn to play. From the interviews it became clear that many of the foursquare-playing children chose this over playing soccer on the field because they found soccer too serious, too competitive and often too conflict-ridden. They wanted to play for fun and preferred the gender and age mixed play and therefore chose to play foursquare. In line with the children's statements we observed more laughing and flirting in the foursquare zone than four-square play.

The small multi court was empty during most of the breaks. The children explained that they needed a special type of ball and that all these balls had disappeared. Rather unexpectedly, we observed four girls pretending to be horse riding and imitating horse dressage using one of the soccer pitches:

Cathrine: I mostly play horse with my girlfriend.

Moderator: Where are you playing that?

Cathrine: In the schoolyard.

Moderator: How do you play horse?

Cathrine: We jump or do dressage or something like that.

Moderator: Are there reasons why you do it in the schoolyard?

Table 2. Characteristics of time spent, activity level and behavior in the Schoolyard during recess.

Schoolyard	Quantitative		Qualitative	
Who	Low n = 21 (14 girls)	Middle n = 35(28 girls)	High n = 21 (2 girls)	Particularly girls from all middle grade classes and few boys.
What MVPA lightSed	Median (IQR) 0.8 (0–3)2.7 (0–16.3)3.5 (0–11.8)	Median (IQR) 3.6 (0–9.3)7.8 (0.1–26.6)4.1 (0–12.2)	Median (IQR) 0.5 (0–22.3)1.3 (0–29.9)0.9 (0–6.9)	Foursquare, shooting hoops, a ‘playing horse’ play, walking around and hanging out.
When Time	Median (IQR)7.0 (0.1–29.6)	Median (IQR) 16.4 (0.3–44.4)	Median (IQR) 13.1 (0.2–48)	Is used during all breaks but most during the short afternoon break because the break is too short to get to the field and start up a soccer game.
Where	The Low PA group is typically in the northern part or close to the building entrances southwards. The Middle PA group uses the whole area but mostly the middle and northern part. The High PA group typically uses the northern part.		Foursquare and shooting hoops were taking place in the northern and middle part of the schoolyard, respectively. The ‘playing horse’ play was taking place on a soccer pitch in the southern area. Hanging out was primarily done on a skateboard ramp and at balancing bars in the southern part. The walking activity was done all over the schoolyard.	
Why	It was the easiest outdoor area to reach from the classrooms and the games played in the schoolyard were experienced less serious and more gender-inclusive than the soccer games on the field.			

Median, IQR and Time all in minutes. Low, children in the lowest activity quartile; Middle, children in the middle two activity quartiles; High, children in the highest activity quartile. Activity quartiles are generated based on mean physical activity during recess. IQR, Inter Quartile Range; MVPA, Moderate to Vigorous Physical Activity; Light, Light activity; Sed, Sedentary activity

doi:10.1371/journal.pone.0148786.t002

Cathrine: Yes, there are marked lines for soccer, which we can use for the horse dressage.

We also observed a number of smaller groups of girls hanging around in the schoolyard talking. Some were sedentary sitting on the skateboard ramp or at the picnic table and some were standing on the balancing bars. Girls were also observed just walking around the schoolyard often arm in arm. Sometimes they stopped for a while talking with some of the girls hanging out before they continued walking in the schoolyard or went indoors.

Field

The field area was verbalized as the “happening” recess location. 20 children (2 girls) belonging to the High PA group were on the field, with a median stay of 35.4 minutes. Their median time spent in MVPA was 14.0 minutes, while a median of 16.0 minutes were spent in light activity. For the Middle PA group, 23 children (18 girls) visited the field, with a median stay of 10.9 minutes, 1.3 minutes in MVPA and 5.2 minutes in light activity. For the 8 children (6 girls) categorized in the Low PA group that visited the field, their median stay was less than a minute (Table 3).

The field was set-up for soccer with four marked soccer fields and soccer goals in different sizes. The grassy grounds were attractive for playing soccer because it was possible to play “real” soccer and tackle without hurting oneself. The children experienced that soccer on the field was one of the few recess activities on the school grounds. Three to four soccer games were played at the same time, primarily during the two main recess periods. Most children preferred to play soccer solely with their classmates. But because of a clear quality hierarchy of the soccer fields they sometimes had to play soccer with children from other classes and grades to

Table 3. Characteristics of time spent, activity level and behavior on the field during recess.

Field	Quantitative			Qualitative
Who	Low n = 8 (6 girls)	Middle n = 23(18 girls)	High n = 20 (2 girls)	Both boys and girls but a preponderance of boys. They preferred to play class-divided.
What MVPA light Sed	Median (IQR) 0.4 (0–2.7)0.3 (0–2.8)0 (0–1)	Median (IQR) 1.3 (0.1–7.1)5.2 (0.3–25.6)1.3 (0.1–10.3)	Median (IQR) 14 (7.5–23.8)16 (3.5–28.3)2.5 (0.1–8.5)	Soccer was the main activity. Hanging out either sedentary or by walking around was a secondary activity.
When Time	Median (IQR)0.8 (0.1–5.7)	Median (IQR) 10.9 (0.5–35.6)	Median (IQR) 35.4 (12.3–47)	Was used during the two main recess periods.
Where	The Middle and High PA group mostly use the southwestern part of the field. The Low PA group is predominantly in the northern part of the field close to the building.			Soccer was played at up to four different soccer fields. The hanging out activity occurred at the sidelines.
Why				Experienced as the most “popular” place in the school ground and one of the only locations with facilities to do recess activities. Moreover, the grassy grounds made it possible to play “real” soccer and tackle without hurting oneself.

Median, IQR and Time all in minutes. Low, children in the lowest activity quartile; Middle, children in the middle two activity quartiles; High, children in the highest activity quartile. Activity quartiles are generated based on mean physical activity during recess. IQR, Inter Quartile Range; MVPA, Moderate to Vigorous Physical Activity; Light, Light activity; Sed, Sedentary activity

doi:10.1371/journal.pone.0148786.t003

play at the best fields placed in the southwestern part of the field. In addition, a grade hierarchy was found in the fight for getting the most attractive soccer fields as shown below:

Alex: If there are some younger students then you can just get rid of them. You can take their goals and annoy them until they leave.

Moderator: Is that what you are doing?

Tom: Yes

Katia: You shouldn't say that, dimwit

Moderator: Is that what the older students do to you as well?

Alex: Yes

The fight for getting the most attractive fields often caused conflicts which the school managed by keeping the involved children in quarantine from the field a couple of days.

Boys as well as a few skilled girls primarily played the soccer games. The field was experienced as a boys' domain, even though also many girls visited the field. Girls stated that it was not motivating to play soccer with the boys because the boys did not pass the ball to them unless they were skilled. Instead most girls observed on the field kept to the sidelines hanging out in smaller groups, possibly because of the status connected with being at the most “happening” place. Some were sitting down watching the game or talking while others were walking around talking and now and then they did some dancing or gymnastic moves.

Discussion

Various studies have emphasized the need for comprehensive explorations of children's PA behavior during recess in order to inform future schoolyard interventions [6, 18–22]. This study contributes to the current literature with an in-depth investigation of children's PA behavior during recess combining the quantitative measurements GPS and accelerometer with qualitative go-along group interviews and participant observations.

In line with Kremers et al. and Troelsen claiming that specific behavioral determinants of energy balanced-related behaviors including PA will differ for different groups [23, 24] our results revealed that children displayed different PA behavior during recess. Also, the children's PA level was associated with their location in the school environment showing a relationship between environment and behavior [24].

Two-thirds of the children belonging to the Low PA group were girls involved in sedentary socializing activities in the classroom. As main reason for their behavior the children expressed a lack of attractive outdoor activity possibilities. Thirty out of the 38 children in the Middle PA group were girls, and many of them were engaged in walk-and-talk behavior, both in the schoolyard and on the field. This group was furthermore involved in foursquare games, shooting hoops, and pretending to be horse riding. Arguments used by the children as to why they were involved in these activities were that they preferred gender and age mixed play, and wanted to avoid the many conflicts associated with soccer. Boys dominated the High PA group and spent most of their time on the field playing soccer. Approximately 50% of their recess time was spent in MVPA. This group took soccer very seriously and a high level of skills was needed to participate in the game.

What to do when planning interventions?

The study gave us an understanding of three groups of children with varied PA behavior and use of different locations during recess. Even though our study was conducted as a pilot study, current data combined with previous findings gave us more insight into how to tailor future interventions to increase recess PA across different groups of children. According to the modified model by Kremers et al. altering environmental determinants in the school setting can influence the children's PA behavior both indirectly and directly [24]. For that reason we will focus on interventions altering the environment in the below suggestions.

When planning to alter PA behavior among the Low PA group, mostly staying indoors, it is important to recognize that they explained that they stayed indoors during recess because of an experienced lack of outdoor play facilities. This perceived lack of outdoor facilities is in line with a number of studies [8, 10, 16, 38]. A review also found a positive association between recess PA and overall facility provision as well as the provision of unfixed equipment [14]. According to the model by Kremers et al. involving the children in making decisions on what kind of facilities should be implemented would be an important factor in changing their PA behavior [23]. Since we found higher PA levels outdoors, implementation of a 'be outdoors during recess' policy could possibly be a strategy to increase the PA level among the Low PA group by directly influencing their automatic, unconscious behavior [23]. Other studies also found that outdoor school environments facilitated play and were associated with increased levels of recess PA [4, 34, 67].

The Middle PA group generated mostly light PA during recess and was predominantly found in the schoolyard. In the schoolyard we found waiting time as a restricting factor for PA due to the limited number of facilities in relation to the number of children wanting to use them (e.g., foursquare pitches and basket hoops). Other studies have found that the number of school-ground play facilities is associated with the daily amount of PA [13, 68, 69]. We also

found that the small multi-court was unused due to a lack of suitable balls. Access to more and different kinds of balls would possibly change PA behavior and generate more PA in the schoolyard. Zask et al. reported that the ratio of balls to children was related to vigorous physical activity (VPA) during recess [70]. Moreover, we found children using facilities differently than expected (e.g., pretending to be horse riding on a soccer pitch), which might call for more variation in facilities. Children asking for more variation in facilities was also found in another study [8].

The third group of children, mostly boys, generated a relatively high amount of MVPA during recess at the soccer field. A previous study also found that time spent in MVPA was highest at the field compared to the playground [4]. This group did not seem in need of any PA stimulating intervention. However, the boys' highly competitive behaviour and the many conflicts occurring at the soccer field could have a negative impact on the children's PA. In a previous study, conflicts were perceived as time consuming and a barrier to recess PA, especially among competitive sports-minded boys [8]. The lack of teacher presence in outdoor areas seems to be related to conflicts, hence increased teacher supervision might lead to faster conflict resolution and provide increased PA, particularly among boys [42, 71]. Similar to a previous study we found that girls wanted to play soccer but felt excluded [16]. Teacher organized recess activities such as soccer could be an initiative to indirectly stimulate involvement of girls in boys' activities, and vice versa, by influencing, what Kremers et al. called, the children's mediators of behavior-specific cognitions [23]. In line with this, a study found that when trained teachers initiated recess activities, this was associated with increased PA [72].

Was mixing all these methods really necessary?

The current study had both strengths and limitations. Mixing four methods is a complex and time-consuming process requiring a high level of resources. However, we found that the mixed methods approach strengthened the study by facilitating a much richer form of data and created a greater credibility of results by offering complementary insights and understandings that neither the quantitative nor qualitative methods alone had the potential to achieve.

The quantitative methods could not identify what kind of activities the children were doing and why they were doing them. As an example the children's PA level at a soccer area in the schoolyard was identified by using accelerometers and GPS but by these methods we could not conclude what they were doing. Unexpectedly, we observed the soccer area being used by girls pretending to be horse riding. Systematic observations like SOPLAY and SOCARP can record both PA levels in open environments and find what the children are doing. But these methods cannot be used to analyze behavior for specific groups due to the lack of background information on the children observed (e.g., PA level, age) [73]. Furthermore, all these methods have limitations in creating an understanding of the factors affecting children's PA behavior. To really understand the children's PA behavior it is crucial also to use qualitative methods [57]. Aside from determining what the children are doing, participant observations can provide insight into children's social relations during activities [54]. Additionally, interviews with the children can reveal the children's perceptions and give explanations of behavior, as for example in this study where a perceived lack of outdoor facilities was given as reason for staying indoors. Particularly, a child participatory method such as the go-along group interview is valuable to capture children's perceptions of PA [57, 74, 75]. However, also the qualitative methods cannot stand alone since it is not possible to group children based on PA intensity or locate larger groups of children's activities and locations.

Mixing accelerometer, GPS, participant observation and go-along group interviews created the opportunity to conduct an in-depth exploration of children divided in a Low, Middle and

High PA group, which can aid development of interventions targeting specific groups of children in the school environment. Moreover, using the Five W Questions as an analytic tool in the analysis of the data facilitated a coherent and structured mixing process that insured an in-depth exploration.

Even though it limited the generalizability we deliberately chose to pilot test the combination of methods focusing on a single school [76, 77]. The argument was to explore the benefits of using the elaborate combination of methods before encompassing on this effort in a larger study including schools from contrasting areas [47]. Replication of the mixed methods in other western schools would be required to further explore PA behavior during recess.

Conclusions

This study contributes to the current literature by an in-depth examination of the PA behavior among a Low, Middle and High PA group of children during recess, using a mixed methods approach. We found that combining quantitative and qualitative methods in exploring children's PA behavior during recess was a valuable approach that did not merely duplicate data but offered complementary insights and understandings that may be difficult to assess through reliance on a single method of data collection. Using a mixed-methods approach to investigate children's PA behavior during recess helped gain in-depth knowledge that can aid development of future interventions in the school environment.

Acknowledgments

We thank all the participating children and their parents for taking part in our study. We also thank the school staff for their assistance in organizing the data collection.

Author Contributions

Conceived and designed the experiments: CSP HBA JS. Performed the experiments: CSP HBA. Analyzed the data: CSP HBA JS. Contributed reagents/materials/analysis tools: CSP HBA JS JT. Wrote the paper: CSP HBA JS JT.

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RESEARCH ARTICLE

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Space, body, time and relationship experiences of recess physical activity: a qualitative case study among the least physical active schoolchildren

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Abstract

Background: Increasing recess physical activity has been the aim of several interventions, as this setting can provide numerous physical activity opportunities. However, it is unclear if these interventions are equally effective for all children, or if they only appeal to children who are already physically active. This study was conducted to explore the least physically active children's "lived experiences" within four existential lifeworlds linked to physical activity during recess: space, body, time, and relations.

Methods: The study builds on ethnographic fieldwork in a public school in Denmark using a combination of participatory photo interviews and participant observation. Thirty-seven grade five children (11–12 years old) were grouped in quartiles based on their objectively measured daily physical activity levels. Eight children in the lowest activity quartile (six girls) were selected to participate in the study. To avoid stigmatising and to make generalisations more reliable we further recruited eight children from the two highest activity quartiles (four girls) to participate.

Results: An analysis of the least physically active children's "lived experiences" of space, body, time and relations revealed several key factors influencing their recess physical activity: perceived classroom safety, indoor cosiness, lack of attractive outdoor facilities, bodily dissatisfaction, bodily complaints, tiredness, feeling bored, and peer influence.

Conclusion: We found that the four existential lifeworlds provided an in-depth understanding of the least physically active children's "lived experiences" of recess physical activity. Our findings imply that specific intervention strategies might be needed to increase the least physically active children's physical activity level. For example, rethinking the classroom as a space for physical activity, designing schoolyards with smaller secluded spaces and varied facilities, improving children's self-esteem and body image, e.g., during physical education, and creating teacher organised play activities during recess.

Keywords: Physical activity, Children, School recess, The four existential lifeworlds, Participant observation, Participatory photo interviews

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Background

Physical activity (PA) in childhood is associated with a multitude of short- and long-term health benefits by its preventive effects on numerous physical conditions, and ability to stimulate cognitive performance and mental wellbeing [1–5]. Despite the benefits of PA, a significant number of children in Denmark and other Western countries do not reach the recommended levels of PA per day [6], and PA typically decreases from being a child to being an adolescent [7, 8]. Since PA patterns in early life are likely to track into adulthood the importance of promoting PA among children is widely recognised [9–11].

School recess is a key setting to provide opportunities for children to be physically active because of its potential to reach and influence a large number of schoolchildren with different backgrounds [12–14]. Studies have also shown that recess can provide one of the largest contributions to children's overall PA [15–17]. Recess can be a valuable contribution to the overall school-day physical activity, particularly for the least physically active children, as they are found to be more physically active during school hours than after school [14, 17, 18].

Increasing schoolyard PA during recess has been the aim of several interventions [19–24]. However, it is unclear if these interventions are equally effective for all children, or if they 'just' provide more opportunities for those who are already physically active. In general, there seems to be little knowledge about who the least physically active children are, although many studies describe girls and obese children as less physically active [14, 25–27]. The least physically active children cannot be considered as a homogenous group due to large individual differences [28]. Since we do not really know who the least physically active children are, we have little information on how they experience school recess and what influences their recess PA. Gaining in-depth knowledge of how the least physically active children experience recess can help develop tailored interventions beneficial to the least physically active children, and subsequently achieve improved health outcomes. Because the decline in PA is associated with the transition from childhood to adolescence we focused this study on children about to transition into adolescence (11–12 year old) to understand the mechanism of PA in this age group [7, 8].

Theoretical framework

To gain insight into the least physically active children's recess experiences a hermeneutic-phenomenological methodology was used as the underlying scientific basis for the study. Hermeneutic phenomenological research is the study of the lifeworld, that is, the meaning given to lived experiences. According to Husserl the lifeworld is an intuited and common world where we act without

reflection [29]. Based on Husserl's phenomenological thinking Van Manen has further developed a methodology of four existential lifeworlds to guide ones reflections on the phenomenon: lived space (spatiality), lived body (corporeality), lived time (temporality), and lived relations (relationality), which pervade the fundamental structure in the lifeworld of everybody independent of history and culture [30, 31].

In the current study, lived space refers to the feelings the children get in different spaces surrounding them in the school setting [30]. Lived body refers to how the children experience their body during recess and how it influences the way they feel and interact [30]. The children's perception of time during recess is regarded as lived time [30]. Lived relations refers to how the children interact with each other during recess [30]. The four-dimensional perspective proves helpful as a guide for reflection in the research process [30] and facilitates an in-depth understanding of the explored phenomenon [32, 33], which in this study is the least physically active children's lived experiences of recess PA.

Aim

The aim of this study was to explore the least physically active children's lived experiences of four existential lifeworlds linked to PA during recess: space, body, time, and relations.

Method

Setting

The study was carried out at a school in a rural lower middle class area in the western part of Denmark. At the school, 381 students, of which 99 % were ethnic Danes, were enrolled in junior (0–3 grade), middle (4–6 grade) or senior (7–9 grade) tiers. During the school day two breaks characterised by free play without any organised curriculum were offered: morning tea and a lunch break, lasting 30 min each. The junior students were required to stay outdoors during recess but the school had no outdoor recess policy for middle and senior tier students. The outdoor school grounds covered 13,311 m² (35 m² per child) and were divided into a paved schoolyard with play markings, a large grassy area with soccer fields, and a well-equipped playground for junior students.

The school was recruited from an existing schoolyard intervention study: The Activating Schoolyards Study aims to improve children's opportunities to become physically active in the schoolyard during recess, particular for the least physically active schoolchildren [34]. The school is similar to many other Danish schools in terms of the type of school buildings, size, recess organisation, type of school ground and number of students [35].

Recruitment and participants

For the current study, our primary interest was to study the least active 11–12 year old children from the two grade five classes at the school (5A and 5B). We used a sampling strategy based on objective measures of PA to classify the children's PA level.

Prior to the current study, the baseline study of the Activating Schoolyards Study assessed children's (grade 4–8) PA level objectively using accelerometers. All children were asked to wear accelerometers for seven consecutive days. During the measurement period the participants also completed an electronic survey, inquiring about background characteristics (e.g., height and weight) [34].

Across the two grade five classes 40 out of 47 children participated in the Activating Schoolyards Study, of whom 37 fulfilled the inclusion criteria of having at least one school day with 9 h of accelerometer data per day. In class 5A 19 children (13 girls) and in class 5B 18 children (11 girls) participated with 1–7 valid days of data. Based on their average daily minutes of moderate-to-vigorous physical activity (MVPA) the 37 children were divided into quartiles. Children within the lowest activity quartile were defined as the least physically active children and with a median of 40 min of MVPA per day they did not reach the recommended levels of 60 min of MVPA per day. Their median MVPA during recess was 5 min. Eight children (six girls) equally distributed between the two grade five classes were part of the lowest activity quartile. Among these, five were overweight based on the BMI threshold definition by Cole et al. [36], using self-reported height and weight measures (Table 1).

To avoid stigmatising and to make generalisations more reliable [37] we further recruited eight children (four girls) for participation in the data collection. The children in this group were equally divided between the two highest activity quartiles and they had a median of 87 min MVPA per day and a median of 16 min of recess MVPA. In total, 16 children participated in the study, eight from the lowest activity quartile and eight from the two highest activity quartiles (Table 1).

During the data collection the researcher in the field (the first author) did not know to which activity quartile the participants belonged in order to minimise the potential bias related to the researcher's pre-understanding of their PA behaviour [30].

Procedure

Data were collected during February and March 2015. The study employed an ethnographic approach [38] using a combination of participant photo interviews [39–41] and participant observation [42, 43]. These methods were chosen to follow the children closely and

Table 1 Main characteristics of eight participants with 25 % lowest daily MVPA and eight children with 50–100 % highest daily MVPA, respectively

Characteristics	25 % lowest daily MVPA 8 = X (100 %)	50–100 % highest daily MVPA 8 = X (100 %)
Minutes of daily MVPA		
<60 min	8 (100 %)	0 (0 %)
≥60 min	0 (0 %)	8 (100 %)
Minutes of recess MVPA		
<15 min	7 (87,5 %)	3 (37,5 %)
≥15 min	1 (12,5 %)	5 (62,5 %)
Class		
5A	4 (50 %)	4 (50 %)
5B	4 (50 %)	4 (50 %)
Gender		
Boys	2 (25 %)	4 (50 %)
Girls	6 (75 %)	4 (50 %)
BMI		
Overweight	5 (62,5 %)	2 (25 %)

MVPA moderate-to-vigorous physical activity
BMI body mass index

gain in-depth insight into the least physically active children's lived experiences of PA during recess. Using multiple methods in researching children's lived experiences during recess offered complimentary insights and understandings [44].

Participatory photo interviews (also called photo elicitation) is a method that uses photographs taken by the participants prior to the interview as a tool during the interview [40]. In our study, 16 children were interviewed individually. The interviews began with exploring their reflections on recess using the photos they had taken [41, 45]. We used the photos to stimulate dialogue, provide nuances, trigger memories [44–46], and reduce the authority of the researcher [47, 48] in line with the new paradigm of childhood [49].

Two days prior to the interview the children were sent a text message to their mobile phone saying: "Please take three photos with your mobile phone of what you are doing during today's recess". The children were instructed to send the photos to a teacher who forwarded all photos to the first author. The interviews took place at various times during the data collection period and lasted approximately 30 min per child. All interviews were recorded using an iPad mini[®]. An interview guide (Table 2) helped to focus on the four dimensions of the lifeworld during the interview [30] and to cross check data between children [50].

Participant observation is a method with roots in traditional ethnographic research and it is accomplished through varying degrees of observation and participation

Table 2 The interview guide used for the participatory photo interviews

Initial questions linked to the photos

- How do you experience recess?
- What do the photos show?
- Why did you take these photos?
- Was it difficult to decide what kind of photos you wanted to take? Why/why not?
- What are you doing in the photo? Do you do that often?
- Who are you together with in the photo?/Are you doing it alone? Why?
- Where are you in the photo? Why are you there?

Supporting questions linked to the four lifeworlds

Lived space:

- Where do you like to go during recess? Why? Are you mostly there?
- Do you miss places to go during recess?

Lived body:

- Do you like to use your body during recess? Why/Why not?
- How do you like to use your body during recess? (Examples)
- How do you experience your own body?

Lived time:

- How do you experience time during recess?
- Do you like the short or the long recess periods most? Why?
- Do you keep an eye on the time during recess? Why/Why not?

Lived relations:

- What is a good class? Are you part of a good class? Why/Why not?
- How do you experience your class during recess?
- Are you playing with someone during recess? Why/Why not? Who?
- Are you together with children from outside your class during recess? Why/Why not? Who?

in the study community's daily activities [42]. In current study, the first author was present at the school 1–2 days each week during the 2 months of data collection following the two classes (5A and 5B). Observing in two classes provided an opportunity to follow children in different class cultures. The observations took place both during free-play activities during recess and during teacher-controlled activities during lessons to get a more complete picture of their school day. To be able to pursue a phenomenon the observations were driven by an open approach to the explored field [51].

It was important to be aware that an adult researcher who attempts to understand children's culture cannot pass unnoticed as a member of that group [43]. Acceptance into the world of children is highly challenging because of the obvious differences between adults and children in terms of cognitive and communicative maturity, power, and physical size [52]. This difference excluded a fully participating role in the children's school

life [53]. The researcher's position was what Spradley calls "moderate participation" [42] where the researcher did not take initiatives directed at the children during observations such as starting a play, mediating in a conflict, or tying shoelaces. However, the researcher was careful of not being too passive. She followed the children around and hung out with them during recess which provided the chance to overhear intimate exchanges giving the researcher insights into the unknown [54].

Ethics

The school principal approved the study and the parents from all 16 children invited to participate provided a written informed consent. If a child featured in photographic material the parents provided written, informed consent for further use of the photo as part of research material for dissemination and publication. All interviews were conducted as a confidential conversation between researcher and child. However, if a child had disclosed that he or she was at risk of harm, then the researcher had a duty to pass this information on to a professional (e.g., a teacher) who could protect the child [55].

According to the Danish National Committee on Health Research Ethics formal ethical approval was not required as the project was not a biomedical research project. Data management and data security procedures with regards to this study were approved by the Danish Data Protection Agency (2013-41-1900). The study adheres to the RATS guidelines for reporting qualitative studies.

Analysis

After the data collection was completed the first author received information on who of the 16 participating children were the least physically active children. All field notes were reviewed and information on the children's activity quartile was added. The 16 audio-recorded interviews were transcribed verbatim by the first author to aid recall and ensure accuracy [56]. The analysis was guided by the four lifeworld existentials: lived space, lived body, lived time, and lived relations. The four existentials were used as the analytical themes throughout the whole analysis. To ensure consistency, the first author manually coded each interview. Field notes and interview transcripts were analysed as a whole to explore the true nature of the phenomenon. The photos taken by the participants prior to the interview were used as supporting material during the analysis.

The analyses were primarily focused on the least physically active children. The first step focused on identifying meaning units for each of the least physically active children to be able to reconstruct a personal core story [30]. In the second more detailed analysis the meaning units of each least physically active child were tentatively grouped to capture the meaning of the experiences

across different children. Finally, the grouped meaning units were compared to data from the other eight children to find similarities and differences between the least physically active and other children.

Results

The lifeworld existentials of lived space, lived body, lived time and lived relations were used to identify the least physically active children's lived experiences of PA during recess. In the following quotes, real names are replaced with aliases.

Recess space

Most of the least physically active children experienced that the classroom was a pleasant place and they remained there during recess. These children expressed a strong affiliation to the classroom calling it "our" room and they explained that special norms and codes of behaviour, only understood by the children attending the class, were connected to the room making it a safe place to stay in. It was important to them that they could close the door and not be interrupted by children from other classes, as the following quote with a girl from class 5B attests:

Julie: It's a cosy place [the classroom], and it's where you belong because you are here all day having all your lessons here.

Interviewer: Why is it important to be someplace during recess were you have a sense of belonging?

Julie: Because you know the place and you can do what you want to do in that place without being disturbed or others being irritated by you.

The classroom was described as a quiet place for sedentary activities during recess and it was in here that most of the least physically active children were observed being immersed in a book, a drawing or a computer game. The classroom was also experienced as a social environment among many of the least physically active children. Togetherness and talking with classmates were two concepts strongly associated with the classroom: "It's the most silent place, you can say, and if you sit in there and read, then your friends are also often in there and you sit talking" (Maria, class 5B).

Some of the least physically active girls also favoured smaller secluded areas fitted with seats for talking and socialising such as a couch in the corridor or a seating arrangement in a corner of the library. The girls perceived these smaller areas as cosy and relaxing places where they could talk about girl-stuff or read a book undisturbed (see Fig. 1).



Fig. 1 Anna's photo of a couch in the corridor where she preferred to stay during recess talking with her friends

Some children told that they were mostly indoors because they perceived a lack of attractive outdoor facilities, as expressed by a girl from class 5A:

Olivia: I miss things to do out in the schoolyard, some swings for instance

Interviewer: Do you prefer to stay outdoors or indoors?

Olivia: If there are things to do I prefer to stay outdoors

Interviewer: So, at the moment what do you prefer?

Olivia: I prefer to stay indoors

Only one boy and one girl among the least physically active children preferred to stay outdoors during recess. They were at the field playing soccer like the majority of the most physically active children, and did not express an innate affiliation to the classroom.

Recess body

The least physically active children were aware of the benefits of having a "fit" and "good-looking" body. Particularly the least physically active overweight girls were

aware that their body did not correspond to the common body ideal. They disliked their body and wanted to lose weight: *"I don't think mine [body] is really beautiful, to be honest. At my confirmation party people should not look at me because I'm chubby, but because I look beautiful in my dress"* (Anna, class 5A). Feelings of body dislike seemed to make them choose recess activities not requiring bodily skills and performing, such as playing computer games, reading books, painting, listening to music and hanging out talking (see Fig. 2). In contrast, the most physically active children expressed that they mastered bodily skills such as *"being fast runners"*, *"good kickers"* or *"being flexible"*.

Some of the overweight children also expressed a feeling of being out-of-breath when using their body physically, or they explained that they were inactive because of *"injured knees"*, *"an injured toe"*, *"stomach pain"* or *"a headache"*: *"Often I have a headache and nausea or something like that. Then I can only sit or lay down"* (William, class 5A). The bodily complaints linked to overweight explained why some of the least physically active children mainly did sedentary activities during recess. However, not all overweight children complained about their body. We also observed an overweight boy being highly physically active playing soccer during recess.

Tiredness was another bodily explanation reported to inhibit the least physically active children in being physically

active during recess. Repeatedly they mentioned episodes where they had been tired because of too little sleep, which hindered PA: *"I want to join but I get tired really quickly. I haven't slept well. Sometimes I don't sleep well"* (Albert, class 5B). In line with this some of the least physically active children also expressed feeling mentally tired after lessons and needing to clear their head during recess by *"relaxing"*. Their lived body experience differed from that of most of the physically active children who described a feeling of being *"hyper"*; an internal unrest in their body during lessons that had to be released by PA during recess, as expressed below:

"Sometimes I can feel that I have been sitting still for a long time and then I really need to move my body. It's like I can feel it in my legs, they start shaking because I have been sitting still too long and then I know when we get a break. I have to go for a walk in the schoolyard or play soccer and that's very pleasant because then I know my legs will not start shaking in the next lesson" (Jane, class 5A).

To reduce their restlessness some of the more active children were sitting on big balls during lessons, rocking back and forth.

Recess time

Objectively, recess has a quantifiable time length. However, the children's subjective perception of time differed. Generally, recess was verbalised as free time where they *"had fun"* or *"had a good time"* because they could do what they wanted to do, in contrast to the lessons, and for that reason recess was often experienced as a period where time went fast. In relation to this, many of the children's experiences of lived time in the recess context were akin to feeling *"timeless"*. Feeling timeless implies the loss of objective time; an experience of being fully immersed in the moment. The least physically active children described playing computer games, talking and reading, as activities that could make them loose track of time during recess.

Some children wanted to utilise the *"fast going"* recess period optimally. Particularly the physically active children who played soccer used the time prior to recess to plan their activity to get the full potential out of the recess period, as described in a field note excerpt from a lunch situation in class 5B:

The teacher starts reading loudly from a book while the children sit quietly eating their lunch. Simon [a boy from the physically active group] suddenly exclaims: "Oh, you are so nice" addressed to the teacher. A boy asks: "why do you say that?" Simon responds: "She allowed us to have recess 1 min

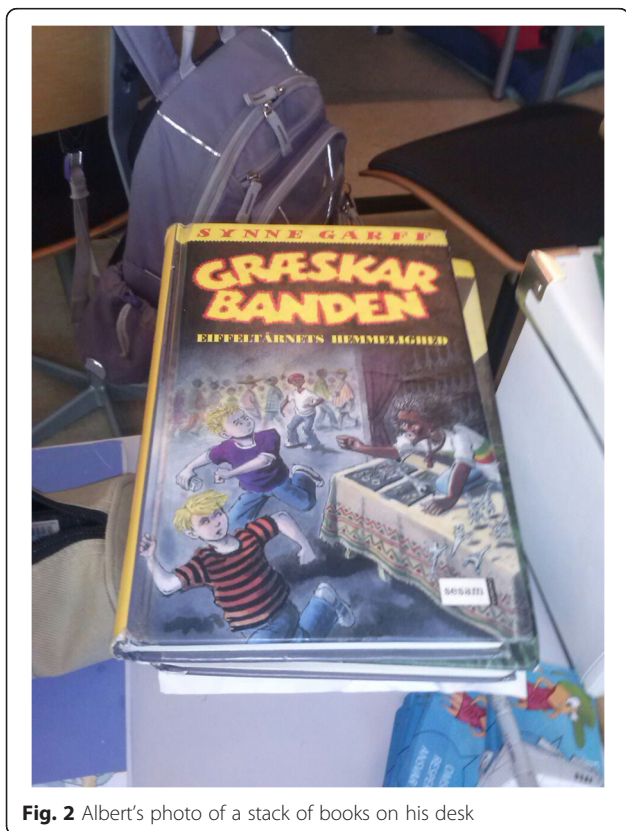


Fig. 2 Albert's photo of a stack of books on his desk

earlier". A couple of minutes before the bell rings, commotion starts in the classroom. The teacher stops reading and say: "calm down, I have promised Simon that you can have your break a little earlier today. It has something to do with getting the soccer goals". She continues reading. Simon stands up from his chair and walks out in the corridor. Some of the other boys turn around and crane their neck to get a better view of the soccer field from the window. Simon enters the classroom again loudly stating: "they are already gone" [some children from class 5A are off to the soccer field]. Simon goes back to his desk and sits down on the edge of his chair constantly looking at a clock hanging at the wall. The teacher closes the book and immediately Simon and many of the other boys run out of the classroom.

Planning recess activities so intensely was not observed among the least physically active children.

We observed that a few of the least physically active children were sitting passively while observing other children's play. These children expressed that recess sometimes felt long. Explanations for this perceived elongated recess were "feeling bored" or "having a bad day", which anchored them in objective time by constantly looking at a clock. They clearly expressed that their perception of time was connected with togetherness: "When I feel bored time is going so slow but together with my friends time goes fast" (Albert, class 5B).

Recess relations

The children believed that having friends contributed to the enjoyment of activities. When children were asked why they participated in activities the most common responses were "because my friends do" or "I like being together with my friends".

Both classes were divided into groups of indoor-staying and outdoor-staying children. Most children in the least physically active group stayed indoors socialising with each other during recess: "We are a bit split up during recess because most are out playing soccer or whatever they are doing, actually I don't know where they are, but we are just sitting indoors talking" (Maria, class 5B). Primarily girls were socialising indoors. The division in outdoor-staying and indoor-staying children seemed strongly peer influenced, but without inducing gender segregation. One of the least physically active boys felt he belonged to the indoor-staying group and he took part in the girls' conversations. Oppositely, one of the least physically active girls belonged to the outside-staying group mostly consisting of boys playing soccer. Her explanation for staying outside playing soccer was that she had just got a new soccer-playing girlfriend who encouraged her to play soccer during recess. In the least

physically active group, the boy who played soccer also had encouraged a friend to start playing soccer, as highlighted below:

I can't get bored with playing soccer. It's also me who has persuaded one of my friends to start playing soccer. I said: "Come outside and try to play during recess then you can see how enjoyable it is". Then he started to go out and play and then he actually found it awesome and now he has started in a soccer club and soccer is one of his main interests (William, class 5A).

Many of the children expressed that they felt they belonged to a group of children coming from the same geographical area because it was easier to be friends with children living nearby. Many of these lived relations were friendships that had started prior to their school attendance and these existing friendships seemed to influence their recess behaviour (see Fig. 3).

In class 5A we observed one of the most physically active girls doing sedentary activities during recess with her friends from the same geographical area (girls from the low activity quartile) even though she had other interests, as outlined in the following quote:

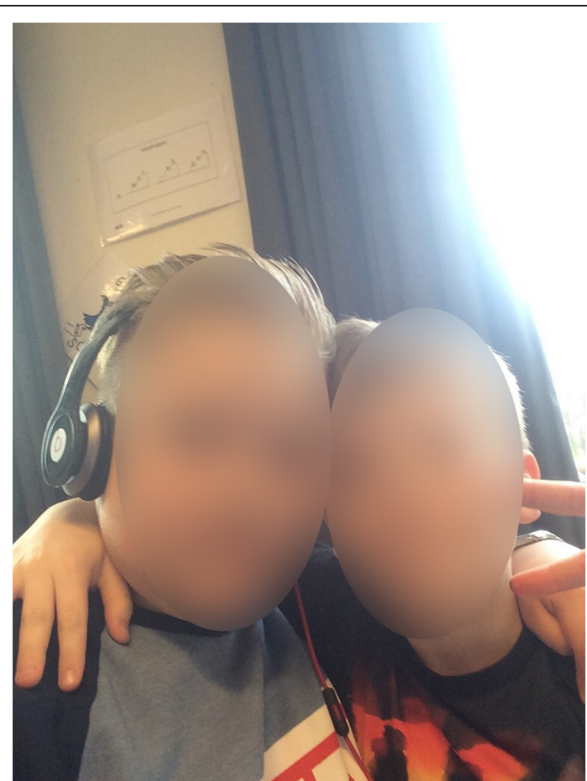


Fig. 3 William's photo of him and his best friend living next to each other. They were together during recess despite having different interests. The parents of the children gave consent to publish the picture

Jane: *We have a pleasant time braiding each other's hair, sitting talking or eating. It's just cosy [during recess].*

Interviewer: *Who are "we"?*

Jane: *Me, Emma, Laura and Olivia. They're my best friends.*

Interviewer: *Why are they your best friends?*

Jane: *We have been friends since our first years. Olivia and I are "baby friends", that is what we call it, because we attended the same day care.*

Interviewer: *Do you also have the same interests?*

Jane: *No, we have a little different interests*

In general, the least physically active children seemed to have good relations to their classmates even though many of them were part of smaller groups keeping their distance from each other. In contrast, many of the most physically active children were part of bigger groups across the two grade five classes playing soccer on the field, which often triggered conflicts about winning. The indoor-staying boy explicitly explained that he stayed indoors during recess because he wanted to avoid the conflicts between the soccer-playing boys.

Discussion

The present study set out to contribute to the current literature on children's recess PA by examining the least physically active children's lived experiences of PA during recess. Using the four existential lifeworlds, lived space, lived body, lived time, and lived relations facilitated a detailed and in-depth understanding of the explored phenomenon.

Six of the eight least physically active children stood out from the rest in regards to lived space during recess preferring indoor space, in particular their classroom. Indoor activities during recess are linked with sedentary activities [14, 57], so staying indoors might influence their recess PA. In regards to lived space "classroom safety", "indoors cosiness" and "lack of attractive outdoor facilities" were perceived as key factors for remaining indoors during recess. According to Van Manen, children need to feel comfortable or intimate in the space [30]. It seemed as if the classroom was the secure inner sanctuary where these children felt protected, similar to being at "home". A place where they could be themselves without being confronted with how good or bad they were at performing certain things [58]. In contrast, the wide-open outdoor space seemed to make them feel exposed,

whereas the outdoor playing children possibly felt free in this setting. In line with this, Rasmussen found that not all children related to official places provided by adults, such as playgrounds during recess, but that they also related to informal places, unnoticed by adults [59]. In our study, most of the least physically active children related to their classroom seat, a couch or a seating arrangement in the library. Another study found that almost half of the 175 children included in the study, mostly girls, wanted the option of staying indoors [60]. In contrast, a study by Darmody et al. found that most children identified the schoolyard as their "favourite" place associated with fun and relaxing [61]. However, that study did not investigate experiences among different subgroups of children.

In regards to lived body, "bodily dissatisfaction" (both regarding bodily aesthetics and skills), "bodily complaints" and "tiredness" were perceived as key factors related to preferring sedentary activities during recess. Other studies have also found body-related barriers to PA among adolescents, such as dissatisfaction with body image and lack of competences [62, 63]. In our study body-related concerns were associated with sedentary behaviour in particular for the overweight girls. One of the overweight boys also preferred sedentary indoor activities, but this was explained by the play on the soccer field being too competitive. The masculine ideal tends to imprint on boys from a young age what it means to be a man. Boys are told that being muscular and competitive are ambitious qualities [64]. For boys not conforming to these ideals, a lack of self-esteem can be a consequence [65, 66]. One boy from the group of least physically active children, who was also overweight, did prefer to play soccer during recess. However, he had difficulties being physically active because of fatigue and somatic pain, as did the overweight girls. In a review by Stankov et al., fatigue and physical discomfort were also found as barriers for being physically active among overweight adolescents [62]. We also found that children complained about bad sleep habits demotivating them from doing recess PA. In line with our study, other studies on children have found associations between inadequate sleep and sedentary time [67] as well as physical inactivity [68].

The least physically active children's temporal perspective showed that recess time was perceived as speeded up when they were enjoying themselves and slowed down when they were feeling bored. In line with our study, a study by Mulryan-Kyne showed that the majority of children typically experienced recess as a fast going enjoyable time [69]. In another study, children mentioned being able to enjoy games and physical exercise as positive features of recess [70], similar to most of the high activity children in our study. In contrast, we found that the least physically active children were more

focused on sedentary socialising activities as positive features of recess. However, sometimes some of the least physically active children were observed being sedentary because they felt bored and alone, which made recess time feel elongated, as explained by Van Manen [30]. Consequently, feeling bored was perceived as a temporal factor related to being sedentary among some of the least physically active children.

Socialising with friends was perceived as important during recess. This is in line with Blatchford et al. who found that recess first and foremost was a social event [71]. A study found that, for many children, school was the only setting in which opportunities for learning to negotiate and manage conflicts as well as form new friendships with a wide range of peers from their own and other classes existed [69]. However, in our study most of the least physically active children were close friends and peer relations had been established in kindergarten. This seemed to impact the individual's choice of recess activities. Typically, they preferred to sit in smaller groups socialising verbally, whereas most of the high physically active children were socialising while using their body. However, one of the least physically active girls was influenced by her peers to play soccer and one of the physically active girls was influenced by her peers to be sedentary during recess. Peer influence seemed to be both a facilitator and barrier to recess PA. Another study only found that peer influence was positively associated with PA [72]. However, that study did not explore different subgroups of children indicating that the negative association between peer influence and PA might relate to the low PA children.

Implications for practice and research

Previous studies have reported that, on average, girls and obese children are less physically active [14, 25–27]. On the basis of current study we pose that treating the least physically active children as one homogeneous group is unproductive. Researchers and professionals working with children's PA during school hours should be aware of the broad range of meanings and experiences linked to the four existential lifeworlds which are complex and interrelated. To increase PA among the least physically children a multi-component intervention is probably necessary.

Rethinking the classroom as a space for PA might be effective for some of the indoor staying children. For example, showing music videos on a screen was found to facilitate dancing in a previous study [28]. Designing schoolyards with smaller secluded spaces and varied PA promoting facilities seems recommendable to motivate children to go outside. This is supported by other studies claiming that more varied spaces [35] and activities in the schoolyard for those who do not want to play soccer will increase the overall PA level [16, 20, 23]. Also children's

attitude towards their own body seems to be an important factor in stimulating children to be physically active. Psychologists have suggested that the most important factors affecting body image are self-esteem and body control [73]. Several studies have shown that PA contributes to a significant increase in self-esteem in both boys and girls [74–76]. It is suggested that schools can play a vital role in improving children's self-esteem and body image [64]. For example by focusing on the psychological mechanisms linked to using your body during physical education. Teacher organised play activities with less focus on competition and skills could be implemented to motivate more children to participate in schoolyard play. This is supported by research findings from a number of studies indicating that structured non-competitive activities with close supervision can promote cooperative play [77–79]. By participating in these activities, children also have the possibility to socialise and form new friendships.

Strength and limitations

The systematic use of the four existential lifeworlds facilitated an in-depth understanding of the least physically active children's lived experiences of recess PA. However, since we used the four existentials as an underlying framework both during data collection and data analysis it was important to be aware of the risk of getting a narrow-minded impression and to be conscious about the fact that the four existentials are a simplification that might not capture the whole lifeworld. Furthermore, the existentials were closely interconnected and the intention was not to separate the children's experiences [80]. Therefore, we continually stepped back from the individual lifeworld-themes to take a more holistic look at the material.

The use of multiple methods strengthened the current study as it enriched the data and improved credibility of results [44]. Particularly, the use of a child participatory approach using photographs taken by the children was valuable to capture the phenomenon of children's lived experiences of recess PA since self-directed photos can capture ordinary interactions of children's daily lives, with the aim of uncovering meaningful content areas that, from an adult viewpoint, might be overlooked [48, 81].

Another strength of our study was the objective participant selection strategy that meant the researcher did not know who the least physically active children were throughout the data collection reducing bias based on pre-understandings, which gave her the analytical opportunity to be challenged in her views [30, 82]. Some of the children surprised us as we, based on the interview and observations, assessed them to be more physically active than they actually were. However, the objective sampling approach also gave us some challenges. Only 37 out of 47 children (78 %) in the two classes had 1–7 valid days of accelerometer data and could potentially be

included in the study. More days of valid data would have been advisable for measuring the children's PA level but would have reduced the amount of participating children further. Another limitation was that the children's BMI was estimated from self reported height and weight. Moreover, the objective data were collected in June 2014 and in the current study data were collected in February and March 2015 and changes in the children's lived experiences of recess PA might have occurred during this time period. However, the external environment remained identical (e.g., the children remained in the middle tier building, and class constellation and recess facilities were equal) and in both data collection periods the weather was variable with changeable temperatures.

Conclusion

We found that Van Manen's four existential lifeworlds provided a useful framework for acquiring an in-depth understanding of the essential aspects of the least physically active children's lived experiences of recess PA. Within all four lifeworlds diverse experiences emerged. Due to the complexity of factors that emerged in this study we pose that treating the least physically active children as one homogeneous group is unproductive in future interventions. Based on this study, rethinking the classroom as a space for PA might be effective for some of the indoor staying children. Furthermore, designing schoolyards with smaller secluded spaces and varied PA promoting facilities is recommendable. Also, improving the least physically active children's self-esteem and body image (e.g., during physical education) may positively influence the children's motivation to be physically active. Finally, teacher organised play activities less focusing on competition and skills could be implemented to motivate more children to participate in schoolyard play.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

CSP carried out the data collection, analysed the data and drafted the manuscript. HBA objectively selected the participants. TTT, JS, HBA and JT participated in designing the study and draft the manuscript. All authors read and approve the final manuscript.

Acknowledgements

The Danish Cancer Society funded the study. The Activating Schoolyards study is part of the Centre for Intervention Research in Health Promotion and Disease Prevention, National Institute of Public Health, University of Southern Denmark. We thank the participating schools, teachers, children and families for their enthusiastic participation in the study.

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Received: 24 June 2015 Accepted: 24 December 2015

Published online: 06 January 2016

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Appendices

STUDY PROTOCOL

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Activating schoolyards: study design of a quasi-experimental schoolyard intervention study

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Abstract

Background: The aim of the Activating Schoolyards Study is to develop, implement, document and assess a comprehensive schoolyard intervention to promote physical activity (PA) during school recess for primary school children (grade 4-8). The intervention is designed to implement organizational and structural changes in the physical environment.

Method: The study builds on a quasi-experimental study design using a mixed method approach including: 1) an exploratory study aimed at providing input for the developing process; 2) an evaluation of the effect of the interventions using a combination of accelerometer, GPS and GIS; 3) a process evaluation facilitating the intervention development process and identifying barriers and facilitators in the implementation process; 4) a post-intervention end-user evaluation aimed at exploring who uses the schoolyards and how the schoolyards are used. The seven project schools (cases) were selected by means of an open competition and the interventions were developed using a participatory bottom-up approach.

Discussion: The participatory approach and case selection strategy make the study design novel. The use of a mixed methods design including qualitative as well as quantitative methods can be seen as a strength, as the different types of data complement each other and results of one part of the study informed the following parts. A unique aspect of our study is the use of accelerometers in combination with GPS and GIS in the effect evaluation to objectively determine where and how active the students are in the schoolyard, before and after the intervention. This provides a type of data that, to our knowledge, has not been used before in schoolyard interventions. Exploring the change in behavior in relation to specific intervention elements in the schoolyard will lead to recommendations for schools undergoing schoolyard renovations at some point in the future.

Keywords: Study design, Participatory intervention development, Mixed method, Schoolyards, Physical activity, GPS, Accelerometer, Observations, Go-along interview, Process

Background

Physical activity (PA) in childhood is associated with a multitude of positive short- and long-term health consequences due to its stimulating influence on physical conditions, cognitive performance and mental well-being [1–5]. In spite of the growing awareness of these benefits, a large number of school children do not reach the

recommended minimum level of 60 min of moderate-to-vigorous physical activity (MVPA) per day in Denmark and other western countries [6, 7]. In addition, an increase in sedentary time is worrying due to the associations with obesity and metabolic risks, independent of the amount of PA [8]. Since both the PA and sedentary behavior pattern in childhood are likely to track into adulthood, the importance of promoting PA and reducing sedentary behavior in childhood is evident [9–12].

Schools, in particular during recess, are key settings to promote PA because of their potential to reach and influence a large number of students with different backgrounds and PA patterns [13, 14]. Recess PA can contribute with up to 40 % of children's recommended daily PA [13],

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and especially for the least active children recess PA has shown to be important [15, 16]. Furthermore, recess PA has been shown to improve cognitive performance, academic achievement, classroom behavior, attention and concentration [12].

Previous recess-based PA interventions have reported mixed results [17–21] and the level of evidence does not seem sufficient to draw conclusions on the intervention effects. Some short-term follow up interventions have shown promising results in increasing PA, *e.g.* adding equipment, playground markings, teachers involvement, and planned activities [18]. However, these results may have captured a novelty effect. More work is needed from different countries in this area, particularly as the structure of recess and implementation of interventions varies within and between countries. Overall there is a growing demand for publishing intervention strategies with an elaborate description of intervention components [19, 22] and long-term follow-up studies are warranted [18, 19].

We developed the Activating Schoolyards Study as a quasi-experimental intervention study with a long-term follow-up. The study is designed to develop, implement, document and assess a comprehensive schoolyard intervention to promote PA in recess for school children (grade 4–8), with a focus on the least active students. The intervention was developed using a participatory approach together with the involved schools and was tailored to the needs of particular schools.

Based on findings from previous intervention studies [23–25] we hypothesized that a high degree of user-involvement, tailored inventive interventions and sufficient funding would lead to increased PA among students. However, exploring and evaluating the effect of the highly tailored interventions requires a special study design. This paper will present the study design, case selection, intervention development, and measurements to be used in the Activating Schoolyards Study.

Method

Setting

Partnership

A partnership consisting of The Danish Cancer Society, The Danish Foundation for Culture and Sport Facilities, and the Danish foundation Realdania had the vision to increase PA in primary schools in Denmark by redesigning and renovating schoolyards. Together they launched the Activating Schoolyards Campaign. The campaign had a budget of approximately 8 million USD, including 2 million USD of local co-funding. The Danish Cancer Society funded the development of study and the scientific assessment. The Partnership appointed a campaign secretariat that was responsible for all practicalities involved in the recruitment process.

Primary schools in Denmark

In Denmark school is mandatory for children between the age of 6 and 16 years. Public schools are free of charge and students do not wear school uniforms. Schools are typically divided into junior (0–3 grade, 6–9 years old), middle (4–6 grade, 10–12 years old) and senior (7–10 grade, 13–16 years old) tiers [26]. Each class has a maximum of 28 gender-mixed students. Students participating in this study attend school for 33 (grade 4–6) and 35 (grade 7–9) hours per week. Approximately 60 min are allocated to recess per day, being distributed over two to four recess periods [26]. In general, the lunch break is the longest recess, lasting 25–30 min. Recess is typically characterized by free play without any organized curriculum. Teachers on yard duty are supervising the students handling conflicts and accidents. Some schools organize ‘Play patrols’ with middle block students organizing games to activate junior students. The junior students must often stay outdoors during recess. There is wide variation in whether schools have an outdoor recess policy for middle- and senior tier students. Seniors are allowed to leave school during recess at most schools.

Study design

The design is based on a quasi-experimental long-term follow-up study of students attending selected primary schools (grade 4–8) in Denmark. To be able to accommodate both an exploratory and an evaluating part of the study, a range of qualitative and quantitative methods were employed to facilitate exploration and evaluation. The Activating Schoolyards Study is divided into four main parts: 1) exploratory study; 2) effect evaluation; 3) process evaluation; 4) post-intervention user-evaluation. The studies were divided into two different phases: 1) the project development pre-study phase and; 2) the study phase. The aim of the studies conducted in the pre-study phase was to provide input and create inspiration for the interventions. The aim of the study phase was to evaluate the Activating Schoolyards Study in terms of effect, process, and user-perspective. The study design with its different sub-studies and phases is illustrated in Fig. 1.

Case selection

The project schools (cases) were selected by means of an open competition in order to stimulate local engagement and participation in the development of the interventions [23]. In October 2012, all primary schools in Denmark (approximately 1800) were invited to submit a vision proposal for improvement of their schoolyard. Out of the 106 submitted proposals, 17 cases were selected for further development in April 2013 by an evaluation panel appointed by the Partnership. Each of these 17 cases received approximately USD 17,000 to further develop their vision

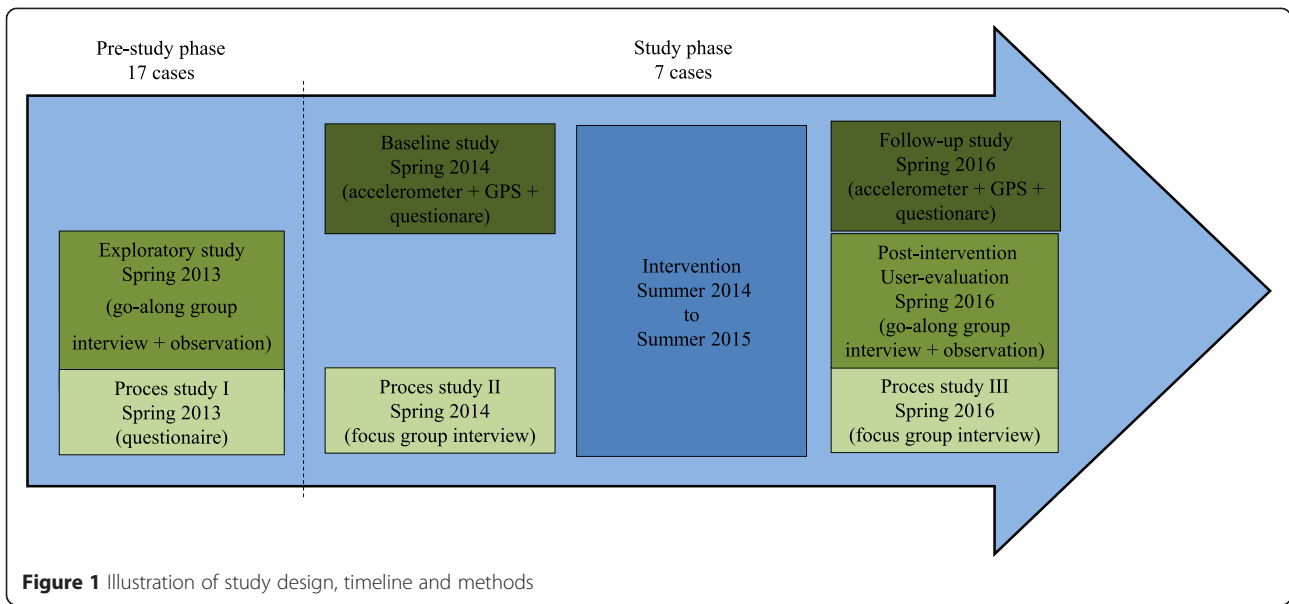


Figure 1 Illustration of study design, timeline and methods

in self-constituted case teams comprised of external consultants chosen by the schools (architects, landscape architects, designers) and stakeholders (students, teachers, parents, neighbors, and local organizations). The 17 project proposals were submitted in December 2013, and in February 2014 the evaluation panel selected seven cases for realization. The case selection process is presented in Fig. 2.

The evaluation panel selected both the vision proposal and the final project description to favor the following selection criteria: innovative solutions promoting PA, inspiration to other schools, focus on less active target groups, integration of the schoolyard in the surrounding local area, organizational initiatives to support the intervention, student and stakeholder involvement, and diversity of locations and target groups. The selected projects

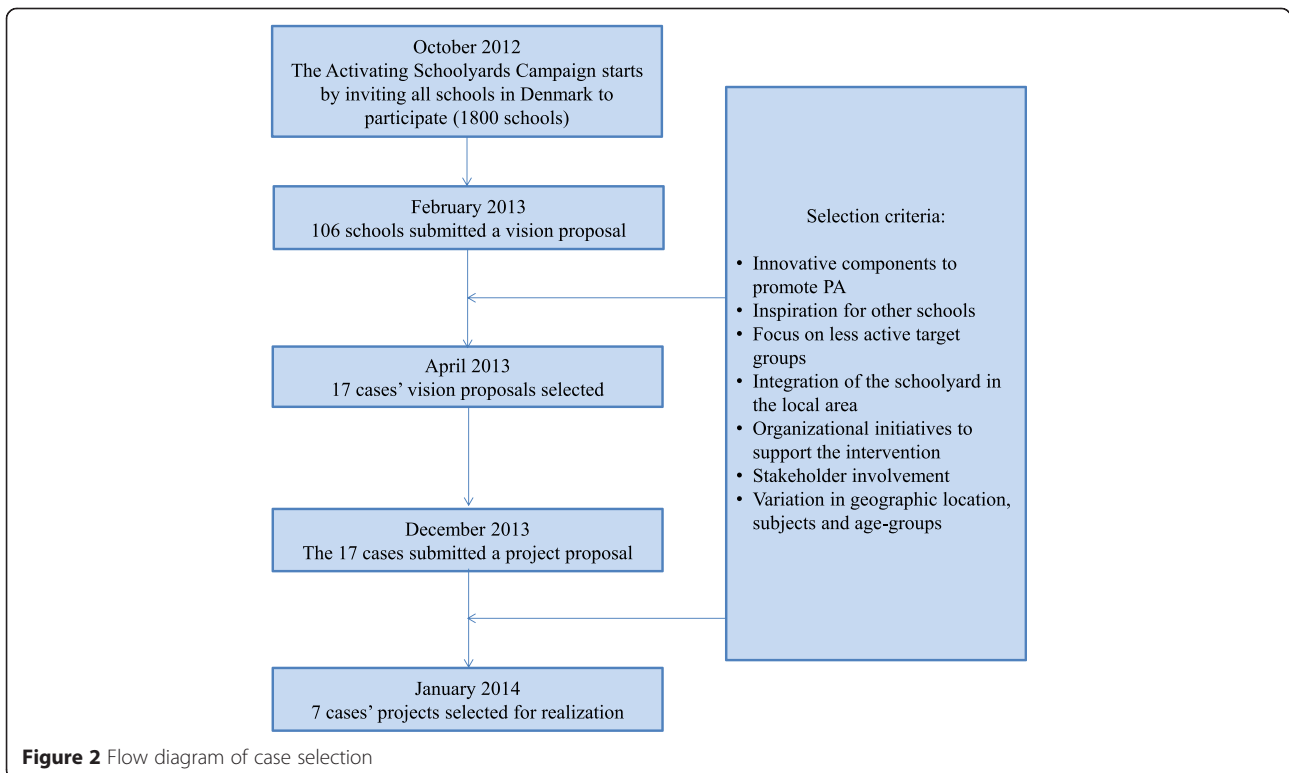


Figure 2 Flow diagram of case selection

had to document that they could provide at least 50 % of the budgeted cost of the project. The total budget for each of the projects ranged from 120,000 to 900,000 USD. The seven cases represent a wide range of schools. As shown in Table 1, the seven cases differed considerably in geographical area, school type (urban or rural), number of students enrolled (middle and senior tiers), socioeconomic status (based on parental income), share of students with a non-Danish ethnicity, square meters of schoolyard per child, number of play facilities, recess duration, number of playground duty teachers, recess rules, and organized play activities during recess.

Development of interventions

The interventions were developed using a participatory bottom-up approach inspired by Community-Based Participatory Research ideas [27]. Building on existing capacities in the 'case' community, the interventions (*e.g.* target groups, areas and components) submitted in the project proposals reflected local challenges and needs. The interventions contain both physical and organizational changes. During the intervention development process, all case teams had access to a campaign website that provided various materials for inspiration including a large number of short thematic case descriptions of other schoolyard renovation projects, as well as short videos with interviews with students, school principals and researchers. The case teams were also obliged to attend two workshops. In May 2013, a start-up workshop was conducted for the 17 case teams aiming to provide inspiration, stimulate innovation and share knowledge from previous schoolyard interventions. Moreover, findings from the exploratory study on the students' perceived barriers for recess PA were presented at this workshop to inspire the development of the organizational changes. A second workshop was organized for the seven case teams in February 2014 focusing on qualifying and anchoring the projects, and providing inspiration for organizational initiatives. Furthermore, the process evaluation was designed to help the case teams think through the decisions made during the intervention development.

It was left up to each case team to decide if and how the provided information and feedback could be incorporated. The whole process led to highly tailored interventions with considerable variation in intervention components between the seven cases. In some of the cases the interventions took place in the existing schoolyard whereas other cases expanded their outdoor area by including adjacent spaces (*e.g.* forests and streets). Even though the design and dimension of the intervention components varied widely, some features were present in several cases, *e.g.* the introduction of climbing walls, balance-bars, amphitheater-stages, skating areas, trampolines, and outdoor lunch eating areas. There were also similarities in the

planned organizational changes, *e.g.* implementation of a movement policy and changes in recess duration. An overview of the intervention elements per case can be found in Table 2. All interventions will be implemented between summer 2014 and summer 2015.

Data collection and measurements

As described above, the study consists of different parts and each part has its own data collection method and measures, described in more detail below. Prior to the Activating Schoolyards Study a pilot study was conducted to test objective and subjective measurements of PA and classification of movement behavior patterns using accelerometers, global positioning system (GPS), questionnaires, class-diaries and interviews. Based on these findings small adjustments were made to improve the data collection procedure.

All parents of the students who participated in our study provided active informed consents, and all participants could withdraw from the study at any time. Data were collected in accordance with the Helsinki declaration. The study and its data-management procedures have been approved by the Danish Data Protection Agency (2013-41-1900 and 2014-41-2801).

Exploratory study

The aim of the exploratory study was to get an understanding of the students' PA patterns and perceived barriers for PA during recess [26]. Non-systematic participant observations were conducted to gain insight in the students' movement patterns, behavior and social interaction during recess [28] whereas interviews were carried out to gather in-depth data of the students perceived barriers for PA during recess [29, 30]. To facilitate the conversation and evoke memories the interviews were carried out in groups walking around in the schoolyard inspired by the go-along interview approach [31]. Data were collected during a one-day visit to the 17 cases selected for further development between April and June 2013. A total of 460 min of recess were observed. The observations were documented with field notes and photos [32]. A nominated teacher who knew the students was asked to identify three boys and three girls from fourth grade classes (10-11 years), representing different levels of PA. We recruited children representing different levels of PA to avoid stigmatizing of the least active children and to make generalizations of this group more reliable [33]. Seventeen go-along group interviews (one in each case) were conducted. In total 111 students (53 boys and 58 girls, mean age 10.4 years) participated in the go-along group interviews. The go-along group interviews lasted for approximately 60 min and were conducted during school hours.

Table 1 Case characteristics regarding the study target group; middle and senior block students

Case	Geographical area	School type	No. on roll	Parents income range*	Share with a non-Danish ethnicity (%)	Size of school-yard (m ²)	Size of school-yard per child (m ²)	No. of play facilities	Recess periods + duration (min.)	No. of duty teachers	Outdoor recess policy	Mobile phone during recess	Recess PA initiatives
1	Region Zealand	Urban	457	-	20	6888	15	15	20 30 5	3	No	Yes	Play patrol***
2**	Capital Region	Urban	174	< Average income	25	3902	22	15	20 30 5	4	No	Yes	Play patrol
	Capital Region	Urban	424	< Average income	14	6767	16	15	15 40 10	4	Yes (middle block during summer)	Yes	
3	Region North	Rural	418	> Average income	0	59333	142	16	20 30	4	Yes (middle block)	Yes	
4	Region North	Urban	406	> Average income	14	33415	82	20	30 30 5 5	5	Yes (middle block)	Yes	Play patrol Sports hall use
5	Central Denmark	Rural	186	< Average income	1	13311	72	11	30 25 10	2	No	Yes	Teacher initiated activities
6	Southern Denmark	Rural	59	> Average income	3	26314	120	27	10 40 25	4	Yes	No	Play patrol Sports hall use
7	Region Zealand	Rural	45	> Average income	0	6747	73	13	15 40 5	2	Yes	Yes	Play patrol

*Published data from Statistics Denmark. One school is not included why it has been merged after the calculation

**Case = the project school. Case 2 includes two schools

***Play patrol = middle block students educated to activate junior students with structured games (voluntary participation)

Table 2 Planned intervention components

Case target group	Physical interventions	Organizational interventions
1 Grade 7-9	Rebuilding a flat asphalt covered schoolyard adding five movement areas: 1. The Hill is 3.5 m tall covered with a climbing wall. Below the hill is a dancing area 2. The Music area is an in-ground-amphitheater beside with three trampolines. 3. The Moat area is an outdoor classroom surrounded by an 80 m ² rein-bed 4. The Playground kitchen is an outdoor canteen. 5. The Play-box is a multi-court	<ul style="list-style-type: none"> • Movement policy • New recess rules • Activities in the lessons • After school activities
2 Grade 7-9	Closing a suburban street between two schools and transform it into areas for movement and places to hangout. The street will frame five areas for activity connected by a bicycle lane/walking path: 1. An angled climbing wall 2. An in-ground mini-court 3. Stumps of concrete 4. A four squared rubber-surfaced area shaped as a tribune with a climbing area. 5. Four sloping asphalt surfaces with soccer-golf on the sides.	<ul style="list-style-type: none"> • Movement policy
3 Grade 4-9	Establishment of a forest-loop merging a forest area and the school ground. The loop runs through the schoolyard and the forest and varies in the design as a consisting of a bench, a tribune, a broken climbing-ladders, balance-bars and a forest-portal. Along the loop different locations are found such as a forest-café, a pit-stop for mountain-bikers, a forest-arena, a forest jump, a playing field and a spider's web.	<ul style="list-style-type: none"> • Movement policy • New rules in recess • Longer recess periods
4 Grade 4-9	Creating a landscape for movement by establishing a learning/activity slope connecting the schoolyard and a forest area. The slope will contain learning locations with QR-codes supplemented with an App. The slope runs by several activity locations such as balance-bars, a climbing-net, swings in the trees, trampolines, a skating area, and an obstacle course.	<ul style="list-style-type: none"> • Longer recess periods
5 Grade 4-6	Rebuilding a traditional flat asphalt covered schoolyard adding three different types of landscapes: 1. The mountain area consisting of several caves, a skate area and The"river delta" for water activities. 2. The forest area with trees, hammocks, and balance-bars. 3. The small-city area with small play houses.	<ul style="list-style-type: none"> • To be developed
6 Grade 4-6	Building a simple 166 m ² "super furniture" including platforms, canopy, stairs and a shed with basic equipment for playing, movement and teaching.	<ul style="list-style-type: none"> • To be developed
7 Grade 4-9	Creating two main spaces for activity connected by running- and obstacle-trails: 1. A multi-court surrounded by activity gables, benches and learning trails. 2. Renovating the existing schoolyard adding a stage, a small hill with trampolines, markings on the asphalt surface, covering the existing walls with blackboards for drawing, teaching and ballgames.	<ul style="list-style-type: none"> • To be developed

Effect evaluation

The aim of the effect evaluation is to examine the effect of the tailored interventions in each of the cases on student's PA and movement patterns during recess. Movement pattern is defined as PA intensity levels at specific geographic locations. The primary outcome is the difference in the objectively measured average activity level (in counts per minute, CPM) during recess in the schoolyard, before and after the intervention. The secondary outcomes are more exploratory examining intervention effects for the least active students, and exploring the change in behavior in specific areas of the schoolyard.

Baseline data were collected April to July 2014, and follow-up data will be collected in the same period (April to July) in 2016. A combination of accelerometers, GPS and geographic information system (GIS) was used to assess behavior changes in time and space in each of the seven cases. Objective PA was recorded as an activity-count every 15 s using the ActiGraph accelerometer model GT3X. The ActiGraph accelerometer has previously been recognized to provide acceptable validity and reliability for measuring children's activity levels and energy expenditure [34, 35]. The students' locations were measured every 15 s using QStarz BT-Q1000xt GPS trackers. The Qstarz GPS units have a median dynamic positional error of 2.9 m in real-world conditions, within

various urban environments and during different modes of transport [36]. The schoolyards were mapped in detail using ArcGIS 10.2 and the total schoolyard area was calculated. During the week of measurements all participants completed an electronic survey, inquiring about self-reported PA, neighborhood and school experiences, and background characteristics.

The students were asked to wear the accelerometer and GPS in an adjustable elastic belt around their waist for seven consecutive days. The equipment was not worn overnight. Verbal and written instructions on wearing of the equipment were given to the students by the research team. To increase compliance short reminder text messages were sent out to the participants' mobile phones twice a day. Two to three randomly selected participants in each class were asked to fill out a short timetable diary containing short questions about their school day and PA during class. Furthermore all schools provided detailed class time tables for the data collection period. At baseline the overall response rate was 52 % with 744 out of 1224 students in grade 4-8 participating. The response rate differed between school and class with a maximum rate of 82 %.

Process evaluation

The aims of the process evaluation were to facilitate the intervention development process and to identify barriers

and facilitators in the implementation process. To help facilitate intervention development, the process evaluation was designed based on formative process evaluation principles [37, 38]. The process evaluation was carried out using an electronic survey to the 17 school principals from the cases selected for development in June 2013 and focus group interviews with the 7 final case teams were conducted in April 2014, and will be conducted in spring 2016. The survey included questions about rules and policies regarding recess, PA, outdoor teaching and activities outside school hours. Furthermore the schools were asked about their initial plans and expectations towards the process.

The focus group interviews included between 5 and 10 members of the final seven case teams and the interviews focused on the case teams' experiences during the project development process and their expectations for the coming implementation process. The interviews took place at the intervention schools and lasted approximately 90 min. The second focus group interviews with the case teams in spring 2016 will provide insights to the organizational changes implemented in each of the cases, as well as the intervention implementation process.

Post-intervention user-evaluation

The aim of the in-depth post-intervention user-evaluation is to explore how, and by whom, the new elements in the schoolyard are used, within and outside of school hours. The study will also explore how students perceive the organizational and physical changes.

Data analysis

Exploratory study

Upon completion of the exploratory study, field notes, interview transcripts and photos were ordered with the explicit purpose of identifying barriers influencing engagement in recess PA across the cases [39]. The data was coded and arranged under headings derived from the social-ecological model distinguishing natural, social, physical and organizational barriers [40].

Effect evaluation

The effect of the schoolyard interventions on PA will be assessed by calculating the difference in the objectively measured average activity level (in counts per minute, CPM) during recess in the schoolyard, before and after the intervention (Δ average CPM during recess) using multilevel modelling to account for the nested structure of the data (*i.e.* time points, students, class, school). The analyses will be adjusted for overall activity levels, age, gender and parents' socio-economic status. Furthermore, analyses of changes in the proportion of time in sedentary, light and MVPA in the schoolyard will be calculated to exemplify change in activity levels post the interventions. To

increase generalizability of the findings, the objectively measured average activity level at the intervention schools will be compared to objectively measure average activity levels of students during recess for approximately 40 other Danish schools. This data is or will be available from other studies conducted by our university department.

The analysis of the secondary outcomes will be more exploratory requiring new methods to clean and prepare useful variable based on combined accelerometer and GPS data. Examples of secondary outcomes are: areas generating high level of activity (CPM or MVPA) in the schoolyard, areas of the schoolyard most likely to encourage MVPA for different groups of students (boys/girls, high/low activity groups, age-groups), exploring routes of activity in the schoolyard.

Process evaluation

A descriptive analysis of data from the pre-intervention electronic survey was conducted to identify the organizational structure at the cases regarding recess and schoolyards policies, rules and practices prior to the intervention. The pre- and post-intervention focus group data will be analyzed as a whole using a thematic analysis strategy [29, 30]. Relevant themes across cases related to how the process was experienced by the case teams and school principals in the different phases will be extracted to identify barriers and facilitators.

Post-intervention user-evaluation

Upon completion of the post-intervention user evaluation, field notes, interview transcripts and photos will be analyzed using a thematic analysis strategy [29, 30]. Themes will be developed through a coding and recoding process in order to identify commonalities and divergences in how the students perceive and use their schoolyard within and between cases [39].

Discussion

The aim of this paper was to present the study design, case selection, intervention development and measurements of the Activating Schoolyards study.

Tailored interventions that consist of changes to the physical schoolyard environment as well as the organizational context will be implemented in seven cases. As there are many different factors that can influence the result of this type of interventions, evaluating the effect and generalizing findings to other situations is rather complex, and requires a multitude of methods. The participatory approach and case selection strategy make the study design novel in many ways, providing a series of benefits, but also some challenges that will be discussed in the next sections.

Design

The design is quasi-experimental, using existing data for comparison. Over the last decade the majority of published recess intervention studies have used randomized control trials (RCT) or quasi-experimental designs [18–20, 41–43]. In contrast to the RCT design we purposefully selected the cases that were to receive an intervention, and will compare the results with data from other cases that were also not randomly selected. In principle, not using an RCT design reduces the internal validity of a study: the starting point for the intervention cases and the comparison cases is not necessarily the same and potential changes might not be (entirely) explained by the intervention. Comparing our results to objectively measured PA levels of students from up to 40 other Danish schools makes it possible to assess if changes occurring over time were the result of temporal trends or the intervention. As the comparison cases were not selected randomly, potential differences between intervention and comparison outcomes are at some risk for confounding or bias.

Case selection

The main reason for purposefully selecting the intervention cases was to increase the external validity of our results. Our intention with the case selection strategy and intervention development was to optimize the conditions needed to create a highly motivating and involving process [23, 24]. With the use of this selection strategy, the intervention development process, and the substantial amount of funding allocated to the cases, we aimed at making our cases 'critical cases' [44]. Theoretically, this means that if we do not find an effect in the current cases, we will not find an effect using this process elsewhere [44]. However, even if the interventions are successful, we fully acknowledge that it will be difficult to implement this type of intervention on a large scale as this would require many resources. Nonetheless, we do think that evaluating the effect and exploring the change in behavior in relation to specific intervention elements in the schoolyard will lead to recommendations for schools undergoing schoolyard renovations at some point in the future. The division of students into groups with different activity levels gives us the opportunity to explore whether specific designs or constructions serve different groups better than other in the recess domain.

Reflecting upon our case selection strategy, we anticipated that the participating schools were highly motivated, and that the competition fostered many original ideas that had strong local support. Even though only seven cases were selected for realization, we expect that some of 106 schools that submitted a vision will, in some way, continue developing their schoolyard; just by entering the competition thoughts and processes were set in motion. Results from the evaluation of another

project with a similar form of recruitment by competition point to this [45].

On a more critical note, we should mention that we as researchers only had an advisory role in the selection of the seven cases. The evaluation panel appointed by the Partnership behind the Activating Schoolyards Campaign made the final decision and even though clear selection criteria were set, personal preferences and interests other than selecting the most appropriate cases seen from a research point of view might have played a role in the case selection.

Development of interventions

During the intervention development phase principles of Community-Based Participatory Research were used to develop tailored interventions. This approach has proven to be an effective and viable approach for addressing social and cultural health disparities in community-based interventions [27]. Based on our previous experiences with schoolyard interventions, we learned that tailoring an intervention to local needs and wishes, building on local engagement, was crucial to the success of the intervention [24]. A consequence of this participatory approach was the diversity in the intervention development process and the driving force behind the ideas. In line with a participatory bottom-up approach it was up to the schools to define their case teams, resulting in a variation in the representatives involved. In some cases one or two teachers were in charge, in other a school principal, in a few cases parents, and sometimes planners from a municipality. Also the extent of student involvement varied. All case teams received similar inputs from researchers to help develop their idea.

Measurements

Using the mixed methods design including qualitative and quantitative methods is a strength, with the different types of data complementing each other [46]. Data collected in the first exploratory study were, apart from being used by the case teams to help develop the interventions, also used to develop the student questionnaire in the effect evaluation. The results from the effect evaluation will be put into perspective using the data from the post-intervention user-evaluation. A process evaluation with several data collection moments will shed light on factors influencing the implementation of the interventions. These results will help understand and explain the results of effect analysis.

A novel aspect of our study is using the combination of accelerometer, GPS and GIS in the effect evaluation to objectively determine where and how active the students are in the schoolyard, before and after the intervention. This type of data has to our knowledge, not been used before in longitudinal studies to evaluate schoolyard interventions

[19, 20]. A number of cross-sectional studies have used similar measures to look at how schoolyard environments influence the activity patterns and intensity levels [47–50].

The combination of accelerometer and GPS is relatively invasive for participants, and this might be reflected in the relatively low participation rate (52 %). Compared to earlier studies using the systematic observation method SOPLAY [25, 51, 52], our method has the added advantage that each individual is identifiable, which means that it is possible to adjust the analyses for the overall PA level of the individual student as well as other personal characteristics [53]. Additionally, the combination of accelerometer, GPS and GIS facilitates comparing activity levels across different locations with different features, something that is not possible in studies using SOPLAY [25]. Another strength of mixing these methods is the opportunity to divide students into groups based on their objectively measured activity level and *e.g.* focus on the least active students. Finally, these methods have the potential to assess if the change in activity in the schoolyard is ‘relocated’ activity (*i.e.* the same activity, but in a different location), or a true increase in activity.

Conclusion

Evaluating the effect and success of schoolyard intervention is complex and the Activating Schoolyards Study represents a new approach in the field of intervention research by its study design, case selection strategy, participatory development of interventions and the use of mixed methods. The study will provide unique insights in the role and importance of the participatory planning process, tailoring changes to local needs and wishes, as well as the success of specific schoolyard elements in attracting active users. These results can be used to guide school administrators in optimizing schoolyard renovation projects.

Abbreviations

CPM: Counts per minute; GIS: Geographic information system; GPS: Global positioning system; MVPA: Moderate to vigorous physical activity; PA: Physical activity; RCT: Randomized control trials.

Competing interest

The authors declare that they have no competing interest

Authors' contributions

HBA, CSP and JS drafted the manuscript and designed the study. MT, HBS and JT contributed to design of the study. HBA and JS developed the effect evaluation, assisted by MT and JT. CSP developed the exploratory study and post-intervention user evaluation, assisted by JT. HBS developed the process evaluation. HBA, CSP, JT and JS conceived of the study. JS is the principal investigator of the study. All authors read and approved the final manuscript.

Acknowledgements

The study was supported by The Danish Cancer Society. The Activating Schoolyard Study is part of the Centre for Intervention Research in Health Promotion and Disease Prevention, National Institute of Public Health, University of Southern Denmark. We thank the participating schools, teachers, students and families for their enthusiastic participation in the study.

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Received: 21 November 2014 Accepted: 12 May 2015

Published online: 31 May 2015

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Den 4. juni 2014

Kære forældre til barn på en "Drøn" skole

Dit barns skole er med i projektet Drøn på Skolegården, som handler om at skabe bedre rammer for bevægelse i skolegården. I den forbindelse skal jeg, som en del af projektet, undersøge hvad skolebørn laver i frikvarteret. Fredag d. 13. juni 2014 skal jeg lave gruppesamtaler med seks tilfældigt udvalgte børn fra hver årgang i mellemtrinnet, som bl.a. skal vise mig deres skolegård. Turen rundt i skolegården videofilmes, men det understreges at optagelserne har fokus på at filme skolegårdens faciliteter og ikke børnene, og at optagelserne kun bruges som en hjælp i min dataindsamling - og vil ikke blive offentliggjort. Børnene indgår anonymt i datamaterialet og kan til enhver tid trække sig ud af undersøgelsen.

Jeg anmoder derfor om tilladelse til at filme dit barn i forskningsmæssig sammenhæng.

Sedlen skal hurtigst muligt og senest torsdag d. 12. juni returneres til klasselæreren for at dit barn kan indgå i undersøgelsen.

Venlig hilsen
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Syddansk Universitet

Dato

Barnets navn

Barnets klasse

Underskrift
