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A systems perspective on children's outdoor play in a disadvantaged area in Denmark – a co-creative approach with children as co-researchers

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ABSTRACT

This study explores what shapes children's outdoor play in a disadvantaged Danish context, emphasizing their own perspectives. Using a Community-Based Participatory Research approach and systems thinking, 56 fourth-grade children (aged 9–11) acted as co-researchers across 14 sessions. Through methods such as photovoice, go-along interviews, mapping, and storytelling, children shared insights into what enables or limits their outdoor play. A systems map was developed to visualize these dynamics. Findings reveal that social connectedness play a central role, reinforcing well-being, motivation, and engagement with outdoor spaces through positive feedback loops. Conversely, lack of peer interaction often led to increased screen use, seen as a socially acceptable alternative. Parents emerged as key mediators, influencing access through support, transport, and safety. School structures and local infrastructure had a dual impact, both facilitating and constraining autonomy. Notably, physical environments alone did not determine play, their relevance depended on children's social interpretations. The study offers a practice-oriented, systemic understanding of outdoor play, highlighting the need for holistic approaches that promote equity, well-being, and health. It underscores the value of listening to children's voices when designing interventions and policies aimed at enhancing outdoor play opportunities in disadvantaged communities.

KEYWORDS

Physical activity; community-based participatory research; systems thinking; children; systems dynamics; systems map

Introduction

Declining physical activity (PA) levels among children have become a growing public health concern, both globally and in Denmark. Although the World Health Organization (WHO) recommends that children engage in at least 60 min of moderate to vigorous physical activity (MVPA) daily (Bull et al., 2020), only a minority of children meet these guidelines. In Denmark, only 27% of children aged 11–17 achieve the

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recommended daily levels of PA (Toftager et al., 2023). Insufficient PA in childhood is associated with an increased risk of various lifestyle-related diseases, including obesity, type 2 diabetes, cardiovascular conditions, and mental health challenges such as anxiety and depression (Akseer et al., 2020; Grosso, 2019; Reilly & Kelly, 2011). Importantly, early habits tend to persist into adulthood, underscoring the importance of establishing healthy lifestyle practices early in life (Sales et al., 2024).

Active outdoor play, defined as *unstructured PA that takes place outdoors in the child's free time* (Tremblay et al., 2015), is a key source of PA for school-aged children (Raustrop et al., 2012), contributing not only to physical health but also to motor, social, and emotional development (Herrington & Brussoni, 2015; Larson et al., 2011; Zarotis, 2020). Studies show that children are generally more active outdoors than indoors, and outdoor play serves as an important source of MVPA (Tremblay et al., 2015; Truelove et al., 2018; Vanderloo & Tucker, 2015). However, opportunities for outdoor play are unequally distributed. Children in socio-economically disadvantaged areas often have limited access to safe, attractive outdoor environments and affordable after-school activities (Prochnow et al., 2020; Visser & Van Aalst, 2021), exacerbating social and health inequalities. Despite increasing attention, there remains limited understanding of how geographical, structural, social, and individual elements interact to shape children's opportunities for outdoor play in such settings (Lee et al., 2021).

Physical inactivity is increasingly recognized as a complex health issue that cannot be effectively addressed through isolated or linear interventions (Rod et al., 2023; WHO, 2018). Addressing such complexity requires participatory approaches that actively involve children in identifying relevant challenges and co-creating meaningful, contextually grounded solutions (Chinapaw & Altenburg, 2023; Sawyer et al., 2012). This reflects a broader shift toward understanding health behaviors as dynamic and systemically interconnected phenomena, in which multiple elements interact and influence one another over time (Uleman et al., 2024). Systems thinking provides a valuable framework for capturing this complexity by examining interconnections and feedback loops between environmental, social, and behavioral factors (Astbury et al., 2021; Meadows, 2008; Meadows, 2009). By moving beyond isolated determinants to consider system-wide interactions, systems thinking helps identify leverage points for sustainable change (Carey et al., 2015; Foster-Fishman & Behrens, 2007).

The B-challenged project built on these principles, combining systems thinking and a participatory approach to promote children's outdoor play and healthy dietary behaviors through co-created, systemic interventions. The study engaged children as co-researchers mapping the complex elements and mechanisms that shaped their opportunities and constraints for outdoor play in a Danish disadvantaged area. The aim was to generate insights that could inform more targeted and locally anchored strategies to promote outdoor play among children in disadvantaged areas of Denmark and similar Western contexts.

Theoretical frameworks

Community-Based Participatory Research (CBPR) serves as the participatory approach for the present study. CBPR aims to engage members of a local community who are directly affected by a particular issue (e.g. low levels of outdoor play) (Minkler &

Wallerstein, 2008). Throughout the research process, CBPR emphasizes an equitable distribution of power between researchers and community members, in this case, local children, by integrating local knowledge with academic expertise to generate outcomes that are directly applicable and beneficial to the community in question (Blumenthal et al., 2013; Cargo & Mercer, 2008). In this study, CBPR was operationalized through 14 sessions with local children, who were actively involved as co-researchers. These sessions employed various participatory methodological tools to facilitate meaningful engagement in the research process.

Systems thinking was applied in the current study to capture and analyze the complexity of outdoor play perceived among the local children. According to Donella Meadows, a system consists of elements and mechanisms that connects the elements (Meadows, 2008). Elements may be tangible – such as people, infrastructure, or resources – or intangible, such as norms, values, or behaviors. Mechanisms are formed through interactions that create the system's dynamics. These mechanisms vary in strength and determine how elements influence each other. Feedback loops – closed chains of causal links – are key mechanisms in systems thinking. They regulate or amplify system behavior, potentially stabilizing or escalating developments (Meadows, 2008). To represent this complexity, a system map can be used (Rutter et al., 2019). It visually illustrates the relationships between elements and mechanisms and serves as an analytical and communicative tool. In this study, a system map is made to help explore the dynamic interplay that shapes children's outdoor play.

Materials and methods

Context

This study is part of the international research project *B-Challenged*, which aims to co-create, implement, and evaluate systemic interventions that promote active outdoor play among children aged 6–12 years. A central focus is on children in disadvantaged areas across five European countries: Denmark, Poland, Spain, Germany, and the Netherlands. This paper focuses solely on the Danish case.

In Denmark, the project is situated in a disadvantaged area within a rural community with 11,930 residents, where approximately 12% are children aged 0–17 (StatBank Denmark, 2025). The area faces demographic shifts such as population decline and aging, potentially affecting children's access to recreational and outdoor spaces. Additionally, the municipality struggles with socioeconomic challenges, including higher unemployment and lower educational levels than the national average (The Danish Ministry of the Interior and Housing, 2022).

Participants

Participant recruitment was initiated through preliminary contact with the municipality's central school, which serves the majority of the area's children, to explore whether the school was interested in participating in the *B-Challenged* project. During a meeting, the school expressed its interest and decided that two fourth-grade classes, 4.A and 4.B, would take part in the project.

Together, the two classes comprise 56 children (25 girls and 31 boys) aged 9 to 11 years. Of these, 49 children are ethnically Danish, and 7 children are from other European countries, primarily Eastern Europe. This age group is particularly relevant to the project, as children at this developmental stage begin to exhibit increased autonomy in their daily lives. They are more likely to move around without adult supervision, explore their local surroundings independently, and make their own choices regarding being physical active (Janssen & Leblanc, 2010). As such, the selected children represent a valuable target group for this study, offering insights into how children in a small, disadvantaged community, with diverse ethnic backgrounds, use or refrain from using local outdoor spaces for play.

Sessions and data collection

To ensure a systematic identification of children's perspectives on outdoor play, 14 sessions were planned and conducted with the children during school hours from January to April 2025. The children were divided into eight action teams, which remained consistent throughout all 14 sessions. Each action team, consisting of 6–8 students, was supported by an assigned adult facilitator (researcher or teacher) to assist with their work. A typical session lasted approximately 80 min. Sessions that took place off school grounds lasted 160 min to allow time for transportation to and from the school. Throughout the 14 sessions, the children acted as co-researchers and engaged with a range of methods, including: post-it note exercise, go-along interview, photovoice, neighborhood mapping, semi-structured interviews, questionnaires, and storytelling.

Post-it note exercise was used to facilitate an open brainstorming activity in which children, working in pairs, identified and wrote down barriers they perceived as hindering outdoor play. Each barrier was written on a separate post-it note, and all groups subsequently presented their notes in a plenary session.

A semi-structured version of go-along interviews, characterized by the interviewer and participant moving through the physical environment while the interview takes place (Carpiano, 2009), were employed to explore children's motivations for and barriers to using the outdoor areas in and around the school grounds. Each action team's adult facilitator carried a sheet of prepared questions and posed them while walking with the children through the area. These questions ensured some consistency across the different groups while remaining responsive to children's perspectives. Example questions included: 'What works well in this area?,' 'What works less well?,' 'What is fun to do here?,' 'What makes this place special?,' 'Who are you usually with here?,' and 'Is there anything you would like to change about this place?' The go-along interviews conducted within each of the eight action teams were audio recorded.

Photovoice is a participatory visual method in which participants use photography to document and reflect on their own experiences and perspectives in relation to specific physical environments (Wang & Burris, 1997). The children were divided into their respective action teams, and each team was assigned a different area in the local neighborhood to explore. Each action team was provided with a picture frame that was red on one side and gold on the other. The children were instructed to take photographs

through both sides of the frame to symbolically express their experiences of the areas. The gold side of the frame was used to highlight spaces they liked or frequently used, whereas the red side represented areas they disliked or rarely engaged with. After exploring the area, the children returned to the school, where they discussed their photographs in groups and shared stories that helped construct a narrative context for the images.

Neighborhood mapping is a research method used to map and analyze physical environmental elements of a specific geographic area (Schoepfer & Rogers, 2014). The aim of the method was to identify which locations children perceived as functional or problematic in relation to play, and to explore the features that make a space suitable for outdoor play. During the activity, each action team was given a map of a designated area in the local neighborhood. On the map, they were instructed to mark locations using either yellow or red stickers, depending on whether they perceived the area as positive (yellow) or negative (red) in terms of opportunities for outdoor play. In addition to the mapping exercise, a creative component was included in which the children were asked to reflect on how the less attractive areas could be improved. Their ideas were audio recorded by the facilitator.

Semi-structured interviews were used to gain in-depth knowledge about the use of, experiences with, and attitudes toward outdoor play in the local area from other local children (Kvale & Brinkamn, 2015). The children developed questions for an interview guide, which ultimately included 20 questions such as: 'What do you enjoy doing outdoors?,' 'Where is it fun to play outside?,' 'Do you feel safe playing outdoors?,' 'What prevents you from spending more time outside?,' and 'Do you have someone to be with when you're outside?' The interviews were conducted as paired interviews, where two child co-researchers interviewed two third-grade children at a time. All interviews were audio recorded.

Questionnaire was used to collect information about children's outdoor play in the local area from a relatively large group of participants (Marshall, 2005). Each action team was assigned a theme, derived from the data collected during the previous sessions. The themes were defined and identified by the research team based on the insights that naturally emerged from the data in previous sessions. To ensure that the language and framing remained grounded in the children's perspectives, the research team named the themes based on the children's stories and experiences. The eight themes were: safety, maintenance, social relations, accessibility, rules, weather, indoor activities, and the municipality. Each action team was tasked with developing questions related to their assigned theme. Additionally, the adult facilitators had prepared one sample question for each theme in advance to guide the children. The questionnaire was constructed using a Likert scale format, where the children were asked to respond to statements using the options: 'Strongly agree,' 'Agree,' 'Disagree,' 'Strongly disagree,' and 'Don't know.' Examples of child-generated questions are: 'I feel safe when I go to the town square,' 'It would be better if there were more trash bins outside,' 'I live far away from my friends,' 'I can easily get to the places where I like to play.' 'The school day would be better if there were more or longer breaks,' 'I go outside when the weather is nice,' 'I don't go outside because I don't know what to do,' and 'There is a lack of playgrounds suitable for our age group.' The final questionnaire included 24 questions (three questions for each of the eight themes) and was created in SurveyXact. All fourth-grade

children received a link to the questionnaire, which was read aloud while they individually completed it on their own computers.

Storytelling interviews were used to explore children's understandings of connections related to outdoor play (Davis, 2007). Within action teams, children were assigned six of 30 previously identified elements, ensuring diverse focus areas. Each child chose one or more elements to which they related and created a comic strip illustrating their experience, embedding the elements in everyday life. Children then presented their comics to their teams while facilitators asked follow-up questions for clarification. These sessions were audio recorded. Afterwards, four children were randomly selected and interviewed in pairs to verify and clarify the identified connections.

Data analysis

Data were systematically collected across methods and sessions (see Table 1). The dataset includes post-it notes, photographs, maps, transcribed interviews, questionnaire responses, and drawings (comic stripes). These materials were reviewed and analyzed to identify key elements and underlying mechanisms.

The identified elements were organized into four thematic categories and refined by removing duplicates, reducing the number of elements from 36 to 32. The 32 elements were presented to the children for validation, ensuring recognition and agreement. Following this verification, two additional elements were merged based on overlap, resulting in 30 finalized elements. These were then translated from the children's own words into neutral, adult language to enable representation on the system map in both positive and negative terms. This neutral framing ensures that emotional connotations do not bias the interpretation of causal relationships within the system (Uleman et al., 2024). The 30 finalized elements and their interrelations were entered into the VensimPLE software. Each of the four thematic categories was color-coded to enhance visual clarity and understanding of the system map's structure.

Ethical considerations

Ethical approval was granted by the Research Ethics Committee at the University of Southern Denmark (24-34821). Parents were informed at a meeting in advance, and children were briefed on their rights, including the option to withdraw at any time without consequence. Respectful data practices were emphasized, including consent for photography and secure storage of audio recordings, accessible only to authorized researchers. All personal data was anonymized.

Table 1. Overview of data collected.

Method	Data material
Post-it note exercise	63 post-it notes
Go-along interviews	8 transcribed interviews
Photovoice	64 photos + notes
Neighborhood mapping	8 maps + notes
Semi-structured interview	26 transcribed interviews
Questionnaire	52 questionnaire responses
Storytelling + validation interviews	39 drawn comic strips, 8 transcribed presentations, and 2 transcribed interviews

Results

A system map was made based on children's narratives and perspectives related to identified elements and mechanisms influencing their outdoor play (Figure 1). To provide clarity in the face of system complexity, the map is categorized into four main themes, grouped by related elements and color-coded as follows: social connectedness (red), parental support (blue), school structures (yellow), and the physical urban environment (green).

Social connectedness

As seen in Figure 2, the children's narratives highlight how social connectedness serves both as a motivation and a precondition for outdoor play. Being with friends fosters a sense of belonging, which positively affects mental well-being and increases motivation to spend time outdoors. In the system map (Figure 2), this is shown to enhance the use of outdoor spaces. The use of outdoor spaces, in turn, stimulates creativity and makes it easier for children to invent games and involve others, increasing time being with friends. As one child put it: 'It makes you happy, because it's nice that someone wants to be with us.' This illustrates a reinforcing feedback loop (R1 in Figure 1) in which being with friends, sense of belonging, mental well-being, motivation, use of outdoor spaces and creative use of outdoor spaces mutually strengthen each other. However, access to social interaction is not guaranteed. Distance is described as a key barrier, for example, limited public transport after school hours restricts opportunities

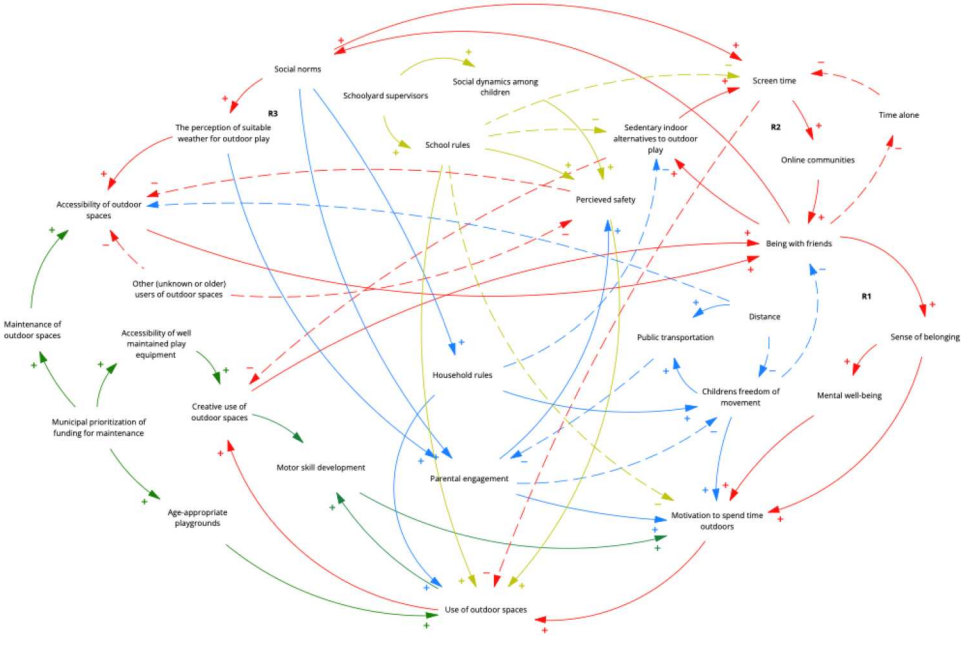

Figure 1. Systems map on outdoor play developed from the children's perspective. The full lines indicate a positive relationship between elements and the dashed line indicate a negative relationship. R indicates a reinforcing feedback loop.

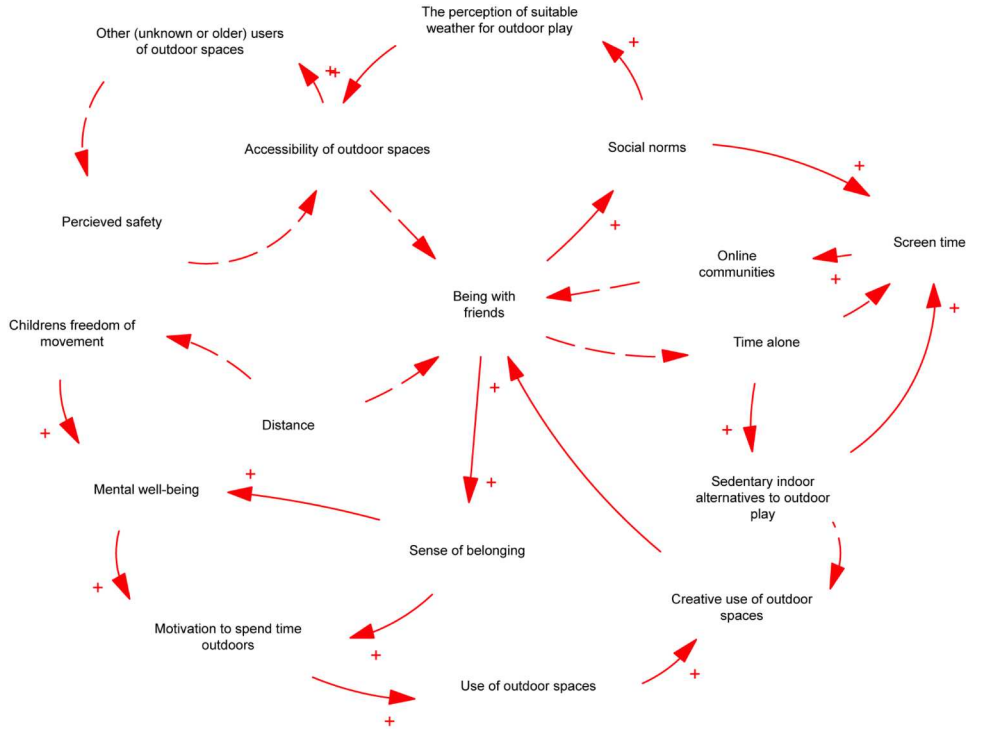

Figure 2. Social connectedness. The figure illustrates how social connectedness and related elements influence children's outdoor play, based on the children's perspective. Full lines indicate positive relationships between elements, while dashed lines indicate negative relationships.

for visiting friends. In the system map, long distances negatively affect freedom of movement and, by extension, opportunities being with friends. This can diminish mental well-being. Conversely, when children experience freedom of movement, they report increased motivation to go outside, which enhances both creativity and social interaction.

Another important system dynamic concerns accessibility to outdoor spaces and perceived safety. Children express discomfort in outdoor spaces where other unknown or older users are present, for example loud or intoxicated adults. In the system map, increased accessibility to outdoor spaces may bring unknown users into play areas, reducing children's perceived safety. Decreased perceived safety decreases accessibility of outdoor spaces, and weakens social connectedness as mentioned above.

Large distance in the local community means that being with friends is not always possible for the children. This increases time spent on sedentary indoor alternatives to outdoor play and raises screen time, which has a direct negative impact on use of outdoor spaces. As one child explained: 'If my friends can't play, then I don't want to be outside. I just go in and play [video games] instead.' A positive aspect of screen time, however, is that children have access to online communities and therefore still have the opportunity for being with friends despite the large distance, forming a reinforcing feedback loop (R2 in Figure 1). Conversely, being with friends reduces time spent alone, which in turn lowers screen time and increases use of outdoor spaces.

Social norms also shape behavior in outdoor spaces. Playing alone is often seen as 'not normal,' prompting some children to stay indoors. In the system map, this norm reinforces screen time, which children explain is widespread: 'Everyone has and uses phones, computers, and TVs every day.' Yet, children also describe how social norms can work in the opposite direction. Peer interactions can shift perceptions, for example, bad weather becomes less of a barrier when play happens with friends. Playing on a trampoline in the rain is described as fun 'as long as we do it together.' In the system map, this illustrates how social interaction can shape norms and expand what is considered suitable weather for outdoor play. This forms a reinforcing feedback loop (R3) where social norms and peer interaction increase access to outdoor spaces – even in poor weather.

Parental support

As seen in Figure 3, children describe how parental engagement outdoors – whether through active participation or simply being nearby – motivates them to go outside. For example, when parents are gardening, children report feeling both safer and more inclined to play outdoors. In the system map (Figure 3), parental engagement is positively linked to children's motivation and use of outdoor spaces, which in turn reduces reliance on sedentary indoor alternatives. Several children mention that screen use occupies a large part of daily life, but that their parents have set rules limiting device time. These household rules emerge in response to broader social norms around screen use, which

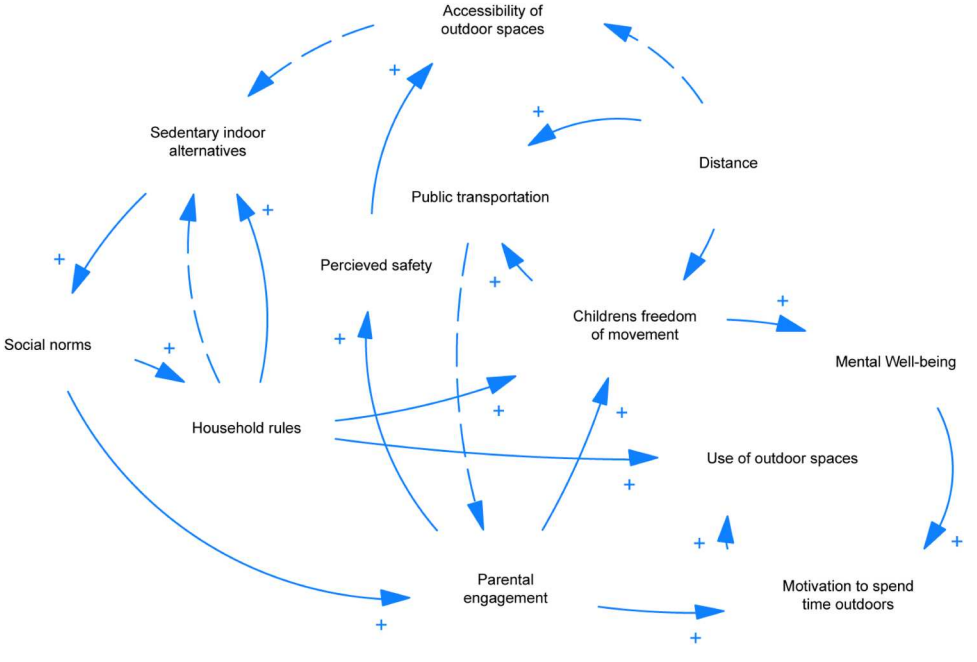

Figure 3. Parental support. The figure illustrates how parental support influences children's outdoor play, based on the children's perspective. Full lines indicate positive relationships between elements, while dashed lines indicate negative relationships.

are reinforced by children's indoor habits. In one comic strip, a child draws her father telling her to go outside instead of staying in front of a screen.

Distance is also identified as a major barrier to outdoor play and being with friends. In the system map, distance negatively affects children's freedom of movement. Many children rely on parental engagement for transport, especially those living in rural areas where public transport is limited. As one child explained: 'I live 11 kilometers away, so I can't bike there. I need my parents to drive me, and they don't always have time or feel like it.' Parental engagement thus directly influences children's freedom of movement, mental well-being, motivation, and use of outdoor spaces. While public transport partly offsets this dependency, it is typically limited to school hours. As a result, staying after school depends on parents, creating a structural vulnerability. In systems terms, this represents a fragile coupling, where the absence of transport weakens the social connectedness and restricts outdoor play.

Other household rules also shape children's freedom of movement. Some are not allowed to go certain places alone or engage in risky activities like climbing trees, negatively influencing outdoor play. In one go-along interview, children mentioned a desire to try a local obstacle course but were not permitted without adult supervision. One child said: 'I have to say where I am and always carry a phone or something. Otherwise, I'm not allowed to go far, because she [my mom] has to know where I am so I'm safe.'

School structures

As seen in Figure 4, children describe schoolyard supervisors as playing a central role during recess, both in enforcing rules and determining which areas children are allowed to access. For instance, access to certain areas, such as the sports field, is restricted to specific days or age groups. One child shared that when it is not their class's turn, they must find alternative activities, while others noted that older students often only have access to the less desirable parts of the field. Although these structures aim to reduce conflict, they also limit children's motivation and use of outdoor spaces.

In a related example, children explained that without a school bell, they rely on supervisors to signal the end of recess. This uncertainty, combined with the distance to classrooms, causes anxiety about being late and reduces motivation to explore further areas of the school grounds. These examples illustrate how the physical and organizational structures of the school influence children's outdoor behavior.

Despite frustrations, many children feel that school rules create a sense of safety, encouraging them to use outdoor spaces. The presence of supervisors reassures them that older children will not bother them. However, others find the rules overly restrictive. One child commented, 'It's the stupid adults' rules,' after being prohibited from playing on large rocks deemed unsafe. Thus, school structures can function both as protective mechanisms and as limitations that reduce children's motivation to engage in outdoor play.

Finally, the school's mobile phone policy (i.e. phones are locked away during the school day) limits screen use and indirectly encourages outdoor play. In this way, school policies shape behavior by limiting indoor alternatives and subtly promoting outdoor play.

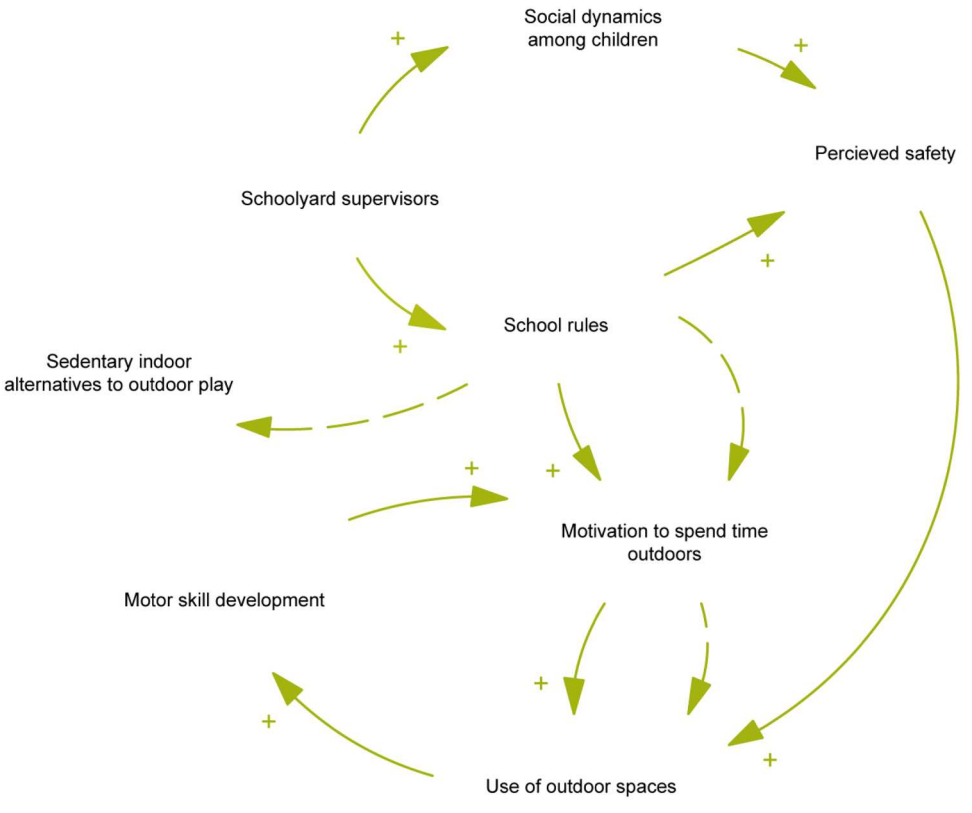

Figure 4. School structures. The figure illustrates how school structures influence children's play, based on the children's perspective. Full lines indicate positive relationships between elements, while dashed lines indicate negative relationships.

Physical urban environment

As seen in Figure 5, children expressed that poorly maintained or dirty outdoor spaces negatively affect their desire to play there. They reported avoiding certain spaces due to broken glass or cigarette butts on the ground. During the *neighborhood mapping* exercise, children repeatedly identified playgrounds as worn down or covered in algae, making them less accessible. In the *photovoice* activity, multiple photos taken through red frames depicted damaged play equipment. The children explained that such equipment was either unsafe or unusable, thus discouraging use.

As illustrated in the system map (Figure 5), the availability and condition of outdoor play equipment influence children's ability to engage in imaginative and creative play. When outdoor play spaces and play equipment are poorly maintained, their usability declines, which in turn limits access and restricts opportunities for creative outdoor play and motor skill development. Conversely, children indicated that if these spaces were well maintained, the polarity of these mechanisms would be positive, enhancing their desire and ability to use local outdoor environments for play.

At the same time, children were aware of inequities in municipal prioritization of funding for maintenance. Some voiced frustration that their neighborhoods received

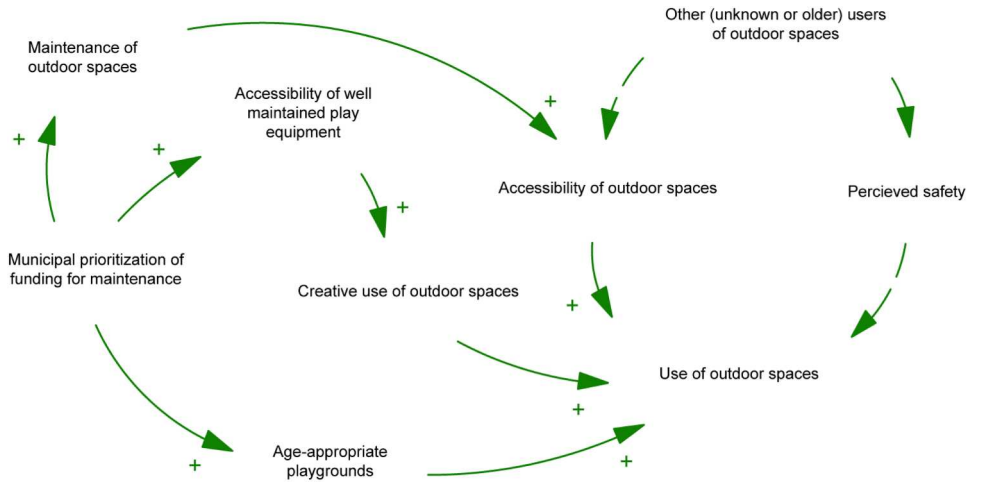

Figure 5. Physical urban environment. The figure illustrates how the physical urban environment influences children's play, based on the children's perspective. Full lines indicate positive relationships between elements, while dashed lines indicate negative relationships.

little investment compared to other areas of the municipality. Even where playgrounds exist, children explained that they remain unused if they are neglected or perceived as boring. This introduces an open loop where regular maintenance can increase accessibility and usage, while continued neglect leads to decline in both.

Design of the outdoor spaces also played a role. Several children felt that the equipment was primarily intended for younger children and thus failed to meet their interests or challenge their skills. As such, when playgrounds are not age-appropriate, they lose functionality within the system and reduce the likelihood of older children engaging in outdoor play.

Discussion

By engaging children as co-researchers, this study resulted in a co-created, narrative-based systems map illustrating the complex elements and mechanisms that shape outdoor play in a Danish disadvantaged area. The systems map is organized into four main themes: social connectedness, parental support, school structures, and the physical urban environment. The discussion is grounded in the study's core analytical findings and critically examined in relation to existing literature to illuminate how they contribute to, refine, or challenge current understanding.

Sense of belonging as a precondition

Children frequently reported that being with friends is not only desirable, but essential to outdoor play. They rarely go outside unless they know their friends will be there. This reliance on peer presence aligns with prior research identifying social relationships as fundamental to children's PA (Svanelöv, 2023). Indeed, norms around outdoor play appear socially enforced. Observational data indicates that 79% of children play

outdoors with others, while only 8% do so alone (Helleman et al., 2023). Parental reports further suggest that children are unlikely to play outside without playmates (Alcantara-Porcuna et al., 2021). These norms may stem not from children's preferences, but from social structures defining 'normal' behavior. It is therefore pertinent to ask whether children's social dependency truly reflects their free choice or is shaped by adult-organized patterns of social interaction. Children spend most of their time in structured, group-based settings under adult supervision, which shape their understanding of what play is and when it is deemed appropriate (Karasel et al., 2025). Consequently, this dependency can be interpreted as a structural norm rather than purely a spontaneous preference.

The social dimension of play is thus complex. While it facilitates belonging, creativity, and well-being (Loebach et al., 2021), it can also exclude those without social ties and foster passivity, where children wait for others to initiate rather than developing their own agency (Ferreira et al., 2024). In our study, the absence of peer engagement often led children to turn to screens as a socially acceptable substitute for connection, highlighting how exclusion from peer play may reinforce solitary, passive forms of engagement. The challenge is to design environments that not only promote social interaction but also empower individual participation, especially for those on the margins of dominant peer groups.

Parental influence on children's freedom of movement

Our study demonstrates that long distances and limited transportation options in rural contexts significantly restrict children's outdoor play. Similarly, Arvidsen et al. (2022) highlight how demographic, social, and environmental factors greatly influence children's use of green spaces. Children living farther from green areas use them significantly less, and parental resources, such as access to a car and flexible working hours, either facilitate or constrain children's ability to access outdoor spaces (Arvidsen et al., 2022). This is consistent with Oliver et al. (2022), who note that spontaneous forms of outdoor play in disadvantaged areas are rarely possible without active adult involvement (Oliver et al., 2022). When play requires transportation and coordination, it loses its immediate, spontaneous character, which, according to Antink-Meyer et al. (2024), may hinder children's development of autonomy and social skills (Antink-Meyer et al., 2024). When opportunities for outdoor play depend in practice on whether parents have access to a car, flexible working hours, and the capacity to organize transportation, a significant inequality arises between urban and rural children. Loebach et al. (2021) emphasize that socioeconomic factors, such as working conditions, transport infrastructure, and access to leisure activities, substantially affect children's opportunities for PA and outdoor play. Parents in peripheral areas may face longer commutes, irregular work schedules, and limited resources, which can impair their ability to support their children's freedom of movement in everyday life. In contrast, children from resource-rich families often have easier access to organized activities and transportation, promoting their participation in outdoor play (Loebach et al., 2021).

According to the WHO (Chaput et al., 2020), access to health-promoting activities is a fundamental right for all children, regardless of geographic location. Municipalities must therefore support child-friendly mobility through flexible public transportation

options, car-pooling schemes, or sustainable travel solutions. Dodd et al. (2021) investigated the relationship between children's independent mobility and PA levels, demonstrating that children with higher degrees of independent mobility are significantly more physically active than those reliant on parental transportation (Dodd et al., 2021). Our study thus challenges both parental dependency and societal willingness to ensure all children, regardless of location, have the opportunity to play outdoors.

The paradox of safety in school

According to the children in our study, school rules and structures serve a dual function. On one hand, clearly defined boundaries and the presence of yard supervisors enhance children's sense of safety by creating a predictable environment. This aligns with research showing that children thrive in settings where they understand the rules and know whom to approach in uncertain or unsafe situations (Jerebine et al., 2022). On the other hand, the children point out that restrictive rules, such as bans on access to certain areas or equipment, can limit their autonomy and creativity. When access to specific spaces, like the soccer field or shrubbery, is restricted, children's opportunities for outdoor play are reduced. These restrictions, often justified by adults' concerns over safety, may hinder children's development of risk-assessment skills and independence. Studies have noted that adults in both school and home environments increasingly express worry about children getting hurt, which often leads to tighter control over play activities (Brussoni et al., 2015; LeMasters & Vandermaas-Peeler, 2021). Such an approach to risk can diminish children's chances to develop crucial skills, including the ability to assess danger, make independent decisions, and build self-confidence (Jerebine et al., 2022). Hence, while school environments have the potential to support outdoor play, this potential can only be realized if rules are perceived as meaningful and flexible, shaped by children's perspectives and needs (Karasel et al., 2025).

Facilities without accompaniment

Although access to green spaces and playground equipment is generally considered supportive of play (Loebach et al., 2021; Schipperijn et al., 2024), our findings indicate that infrastructure alone does not guarantee usage. Children emphasize that outdoor spaces are only appealing when peers are present, thus, facilities serve as meaningful resources only when embedded in social practices. Many interventions assume a linear relationship between facility provision and use – a simplification that fails to recognize the interdependence of physical, social, and structural factors (Rod et al., 2023). The present study highlights the complexity of the system, indicating that effective interventions must go beyond merely physical solutions, such as the frequent municipal response of installing a playground (Acciai et al., 2023). Some children in our study face limitations due to low freedom of movement, lack of parental support, or social exclusion, which restricts their ability to access and use outdoor spaces for play. Consequently, the absence of outdoor play cannot necessarily be addressed by increasing the number of facilities alone, unless conditions are also created that enable children to actually make use of these spaces.

Strengths and limitations

This study used a participatory approach based on CBPR (Minkler & Wallerstein, 2008) employing creative, child-centered methods that helped reduce adult–child power imbalances (Hayball & Pawlowski, 2018). Data were gathered through multiple methods over 14 sessions, enabling rich, context-sensitive insights. Group dynamics sometimes led to unequal participation, with some children's voices dominating. To address unequal participation in groups, tools like surveys helped all children express their experiences.

Systems thinking (Meadows, 2008) facilitated analysis by visualizing complex elements affecting outdoor play but required abstraction that could distance findings from children's original views (Emke et al., 2024). To maintain alignment, system maps were used dialogically with children, though the maps reflected developmental limits, such as fewer feedback loops, highlighting children's focus on concrete experiences over systemic narratives. This highlights both the strengths and limitations of child-led systems mapping and points to the importance of interpreting such outputs with an awareness of children's cognitive and developmental capacities.

The study is contextually bound to a disadvantaged area in Denmark. While this limits generalizability, contextual descriptions support analytical transferability (Stalmeijer et al., 2024), allowing insights to inform practice in similar socio-structural settings.

Conclusion

This study applied CBPR and systems thinking to explore the dynamics shaping children's outdoor play in a disadvantaged Danish context. By engaging children as co-researchers, a system map was developed to visualize key factors influencing outdoor play.

Findings highlight the central role of social connectedness, reinforcing mental well-being, motivation, and use of outdoor spaces through positive feedback loops, while the absence of peer interaction often led to increased screen use. Parents were key mediators, shaping access to outdoor spaces through support, transport, and safety provision. School structures and local infrastructure both enabled and restricted autonomy, and physical environments only influenced play when interpreted through children's social perspectives.

This study provides a practice-oriented and systematic understanding of children's outdoor play from their own perspectives, emphasizing holistic approaches that promote equity, well-being, and health. Next steps for the B-Challenged project include identifying leverage points within the system and implementing targeted actions to support outdoor play. Future research should evaluate whether these co-created, systemic interventions lead to greater improvements in outdoor play and related health outcomes.

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References

Acciai, F., DeWeese, R. S., Lloyd, K., Yedidia, M. J., Kennedy, M., DiSantis, K. I., Tulloch, D., & Ohri-Vachaspati, P. (2023). The relationship between changes in neighborhood physical environment and changes in physical activity among children: A prospective cohort study. *International Journal of Behavioral Nutrition and Physical Activity*, *20*(1), 82. https://doi.org/10.1186/s12966-023-01478-2

Akseer, N., Mehta, S., Wingle, J., Chera, R., Brickman, Z. J., Al-Gashm, S., Sorichetti, B., Vandermorris, A., Hipergrave, D. B., Schwalbe, N., & Bhutta, Z. A. (2020). Non-communicable diseases among adolescents: Current status, determinants, interventions and policies. *BMC Public Health*, *20*(1), 1908. https://doi.org/10.1186/s12889-020-09988-5

Alcantara-Porcuna, V., Sanchez-Lopez, M., Martinez-Vizcaino, V., Martinez-Andres, M., Ruiz-Hermosa, A., & Rodriguez-Martin, B. (2021). Parents' perceptions on barriers and facilitators of physical activity among schoolchildren: A qualitative study. *International Journal of Environmental Research and Public Health*, *18*(6), 3086. https://doi.org/10.3390/ijerph18063086

Antink-Meyer, A., Lorsbach, A. W., & Brown, R. A. (2024). Children's nature play: Access to the outdoors and interactions with biodiversity. *Journal of Adventure Education and Outdoor Learning*, 1–17. https://doi.org/10.1080/14729679.2024.2420316

Arvidsen, J., Schmidt, T., Præstholm, S., Aandkjær, S., Oloafsson, A. S., Nielsen, J. V., & Schipperijn, J. (2022). Demographic, social, and environmental factors predicting Danish children's greenspace use. *Urban Forestry & Urban Greening*, *69*, 127487. https://doi.org/10.1016/j.ufug.2022.127487

Astbury, C. C., Mcgill, E., Egan, M., & Penney, T. L. (2021). Systems thinking and complexity science methods and the policy process in non-communicable disease prevention: A systematic scoping review protocol. *BMJ Open*, *11*(9), e049878. https://doi.org/10.1136/bmjopen-2021-049878

Blumenthal, D. S., Diclemente, R. J., Braithwaite, R., & Smith, S. (2013). *Community-based participatory health research: Issues, methods, and translation to practice*. Springer Publishing Company.

Brussoni, M., Gibbons, R., Gray, C., Ishikawa, T., Sandseter, E. B., Bienenstock, A., Chabot, G., Fuselli, P., Herrington, S., Janssen, I., Pickett, W., Power, M., Stanger, N., Sampson, M., & Tremblay, M. S. (2015). What is the relationship between risky outdoor play and health in children? A systematic review. *International Journal of Environmental Research and Public Health*, *12*(6), 6423–6454. https://doi.org/10.3390/ijerph120606423

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J. P., Chastin, S., Chou, R., Dempsey, P. C., Dipietro, L., Eekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., … Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, *54*(24), 1451–1462. https://doi.org/10.1136/bjsports-2020-102955

Carey, G., Malbon, E., Carey, N., Joyce, A., Crammond, B., & Carey, A. (2015). Systems science and systems thinking for public health: A systematic review of the field. *BMJ Open*, *5*(12), e009002. https://doi.org/10.1136/bmjopen-2015-009002

Cargo, M., & Mercer, S. L. (2008). The value and challenges of participatory research: Strengthening its practice. *Annual Review of Public Health*, *29*(1), 325–350. https://doi.org/10.1146/annurev.publhealth.29.091307.083824

Carpiano, R. M. (2009). Come take a walk with me: The "go-along" interview as a novel method for studying the implications of place for health and well-being. *Health & Place*, *15*(1), 263–272. https://doi.org/10.1016/j.healthplace.2008.05.003

Chaput, J. P., Willumsen, J., Bull, F., Chou, R., Eekelund, U., Firth, J., Jago, R., Ortega, F. B., & Katzmarzyk, P. T. (2020). 2020 WHO guidelines on physical activity and sedentary behaviour for children and adolescents aged 5-17 years: Summary of the evidence. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(1), 141. https://doi.org/10.1186/s12966-020-01037-z

Chinapaw, M. J. M., & Altenburg, T. M. (2023). Knowledge in youth is wisdom in age: Involving young people in research. *Nature Reviews Endocrinology*, *19*(3), 125–126. https://doi.org/10.1038/s41574-022-00796-y

Davis, P. (2007). Storytelling as a democratic approach to data collection: Interviewing children about reading. *Educational Research*, *49*(2), 169–184. https://doi.org/10.1080/00131880701369693

Dodd, H. F., Fitzgibbon, L., Watson, B. E., & Nesbit, R. J. (2021). Children's play and independent mobility in 2020: Results from the British children's play survey. *International Journal of Environmental Research and Public Health*, *18*(8), 4334. https://doi.org/10.3390/ijerph18084334

Emke, H., Altenburg, T., Dijkstra, C., Pinzon, A. L., Stronks, K., Waterlander, W., Kremers, S., & Chinapaw, M. (2024). Applying systems thinking in youth–centred participatory action research for health promotion in an underserved neighbourhood. *Frontiers in Public Health*, *12*, 1272663. https://doi.org/10.3389/fpubh.2024.1272663

Ferreira, I. A., Fornara, F., Pinna, V., Manca, A., & Guicciardi, M. (2024). Autonomy as key to healthy psychological well-being: A systematic literature review on children's independent mobility, cognitive and socio-emotional development. *Journal of Transport & Health*, *38*(2), 101837. https://doi.org/10.1016/j.jth.2024.101837

Foster-Fishman, P. G., & Behrens, T. R. (2007). Systems change reborn: Rethinking our theories, methods, and efforts in human services reform and community-based change. *American Journal of Community Psychology*, *39*(3-4), 191–196. https://doi.org/10.1007/s10464-007-9104-5

Grosso, G. (2019). Impact of nutritional risk factors on chronic non-communicable diseases. *European Journal of Public Health*, *29*(Suppl. 4), ckz185.197. https://doi.org/10.1093/eurpub/ckz185.197

Hayball, Z. F., & Pawlowski, C. S. (2018). Using participatory approaches with children to better understand their physical activity behaviour. *Health Education Journal*, *77*(5), 542–554. https://doi.org/10.1177/0017896918759567

Helleman, G., Nio, I., & De Vries, S. I. (2023). Playing outdoors: What do children do, where and with whom? *Journal of Childhood, Education & Society*, *4*(3), 322–337. https://doi.org/10.37291/2717638X.202343285

Herrington, S., & Brussoni, M. (2015). Beyond physical activity: The importance of play and nature-based play spaces for children's health and development. *Current Obesity Reports*, *4*(4), 477–483. https://doi.org/10.1007/s13679-015-0179-2

Janssen, I., & Leblanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, *11*(7), 40. https://doi.org/10.1186/1479-5868-7-40

Jerebine, A., Fitton-Davies, K., Lander, N., Eyre, E. L. J., Duncan, M. J., & Barnett, L. M. (2022). All the fun stuff, the teachers say, 'that's dangerous!' Hearing from children on safety and risk in active play in schools: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *19*(1), 72. https://doi.org/10.1186/s12966-022-01305-0

Karasel, N., Özdemir, S., Güneyli, A., & Vaiz, O. (2025). Primary school playgrounds: A holistic approach to fun, health, and safety. *Humanities and Social Sciences Communications*, *12*(1), 526. https://doi.org/10.1057/s41599-025-04542-3

Kvale, S., & Brinkamn, S. (2015). *InterViews – Learning the craft of qualitative research interviewing*. Hans Reitzels Forlag.

Larson, L. R., Green, G. T., & Cordell, H. K. (2011). Children's time outdoors: Results and implications of the National Kids Survey. *Journal of Park and Recreation Administration*, *29*(2), 1–20.

Lee, E. Y., Bains, A., Hunter, S., Ament, A., Brazo-Sayavera, J., Carson, V., Hakimi, S., Huang, W. Y., Janssen, I., Lee, M., Lim, H., Silva, D. A. S., & Tremblay, M. S. (2021). Systematic review of the correlates of outdoor play and time among children aged 3–12 years. *International Journal of Behavioral Nutrition and Physical Activity*, *18*(1), 41. https://doi.org/10.1186/s12966-021-01097-9

LeMasters, A. C., & Vandermaas-Peeler, M. (2021). Exploring outdoor play: A mixed-methods study of the quality of preschool play environments and teacher perceptions of risky play. *Journal of Adventure Education and Outdoor Learning*, *23*(1), 1–13. https://doi.org/10.1080/14729679.2021.1925564

Loebach, J., Sanches, M., Jaffe, J., & Elton-Marshall, T. (2021). Paving the way for outdoor play: Examining socio-environmental barriers to community-based outdoor play. *International Journal of Environmental Research and Public Health*, *18*(7), 3617. https://doi.org/10.3390/ijerph18073617

Marshall, G. (2005). The purpose, design and administration of a questionnaire for data collection. *Radiography*, *11*(2), 131–136. https://doi.org/10.1016/j.radi.2004.09.002

Meadows, D. H. (2008). *Thinking in systems: A primer*. Chelsea Green Publishing.

Meadows, D. H. (2009). *Thinking in systems*. Earthscan.

Minkler, M., & Wallerstein, N. (2008). Community-based participatory research: A strategy for building healthy communities and promoting health through policy change.

Oliver, B. E., Nesbit, R. J., McCloy, R., Harvey, K., & Dodd, H. F. (2022). Parent perceived barriers and facilitators of children's adventurous play in Britain: A framework analysis. *BMC Public Health*, *22*(1), 636. https://doi.org/10.1186/s12889-022-13019-w

Prochnow, T., Umstattd Meyer, M. R., Bridges Hamilton, C. N., & Pollack Porter, K. M. (2020). Differences in child physical activity levels at rural play streets due to activity type and sex. *Journal of Healthy Eating and Active Living*, *1*(1), 16–26. https://doi.org/10.51250/jheal.v1i1.5

Raustrop, A., Pagels, P., Boldemann, C., Cosco, N., Söderström, M., & Mårtensson, F. (2012). Accelerometer measured level of physical activity indoors and outdoors during preschool time in Sweden and the United States. *Journal of Physical Activity and Health*, *9*(6), 801–808. https://doi.org/10.1123/jpah.9.6.801

Reilly, J. J., & Kelly, J. (2011). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: Systematic review. *International Journal of Obesity*, *35*(7), 891–898. https://doi.org/10.1038/ijo.2010.222

Rod, N. H., Broadbent, A., Rod, M. H., Russo, F., Arah, O. A., & Stronks, K. (2023). Complexity in epidemiology and public health. Addressing complex health problems through a mix of

epidemiologic methods and data. *Epidemiology*, *34*(4), 505–514. https://doi.org/10.1097/EDE.0000000000001612

Rutter, H., Cavill, N., Bauman, A., & Bull, F. (2019). Systems approaches to global and national physical activity plans. *Bulletin of the World Health Organization*, *97*(2), 162–165. https://doi.org/10.2471/BLT.18.220533

Sales, W. B., Maranhao, E. F., Ramalho, C. S. T., Macedo, S., Souza, G. F., & Maciel, A. C. C. (2024). Early life circumstances and their impact on health in adulthood and later life: A systematic review. *BMC Geriatrics*, *24*(1), 978. https://doi.org/10.1186/s12877-024-05571-4

Sawyer, S. M., Afifi, R. A., Bearinger, L. H., Blakemore, S. J., Dick, B., Ezeh, A. C., & Patton, G. C. (2012). Adolescence: A foundation for future health. *The Lancet*, *379*(9826), 1630–1640. https://doi.org/10.1016/S0140-6736(12)60072-5

Schipperijn, J., Madsen, C. D., Toftager, M., Johansen, D. N., Lousen, I., Amholt, T. T., & Pawlowski, C. S. (2024). The role of playgrounds in promoting children's health – A scoping review. *International Journal of Behavioral Nutrition and Physical Activity*, *21*(1), 72. https://doi.org/10.1186/s12966-024-01618-2

Schoepfer, I., & Rogers, S. R. (2014). A new qualitative GIS method for investigating neighbourhood characteristics using a tablet. *Cartographica*, *49*(2), 127–143. https://doi.org/10.3138/carto.49.2.1810

Stalmeijer, R. E., Brown, M. E. L., & O'Brien, B. C. (2024). How to discuss transferability of qualitative research in health professions education. *The Clinical Teacher*, *21*(6), e13762. https://doi.org/10.1111/tct.13762

StatBank Denmark. (2025). Statistics Denmark. Population of Rudkøbing (Municipality of Langeland).

Svanelöv, E. (2023). 'You don't want to do things alone': Children in low to middle schools talk about physical activity during recess time. *Sport, Education and Society*, *29*(8), 952–965. https://doi.org/10.1080/13573322.2023.2246475

The Danish Ministry of interior and Housing. (2022). Development partnership for 2022–2025 between Langeland Municipality and the Ministry of the Interior and Housing. In: HOUSING, T. D. M. O. I. A. (Ed.).

Toftager, M., Brønd, J. C., Eghøj, M., Damsgaard, M. T., & Madsen, K. R. (2023). Fysisk aktivitet og stillesiddende adfærd blandt elever i 5.-9. Klasse. National monitorering med bevægelsesmålere, Skolebørnsundersøgelsen 2022. In: UNIVERSITET, S. (Ed.).

Tremblay, M. S., Gray, C., Babcock, S., Barnes, J., Bradstreet, C. C., Carr, D., Chabot, G., Choquette, L., Chorney, D., Collyer, C., Herrington, S., Janson, K., Janssen, I., Larouche, R., Pickett, W., Power, M., Sandseter, E. B., Simon, B., & Brussoni, M. (2015). Position statement on active outdoor play. *International Journal of Environmental Research and Public Health*, *12*(6), 6475–6505. https://doi.org/10.3390/ijerph120606475

Truelove, S., Bruijns, B. A., Vanderloo, L. M., O'Brien, K. T., Johnson, A. M., & Tucker, P. (2018). Physical activity and sedentary time during childcare outdoor play sessions: A systematic review and meta-analysis. *Preventive Medicine*, *108*, 74–85. https://doi.org/10.1016/j.ypmed.2017.12.022

Uleman, J. F., Stronks, K., Rutter, H., Arah, O. A., & Rod, N. H. (2024). Mapping complex public health problems with causal loop diagrams. *International Journal of Epidemiology*, *53*(4), dyae091. https://doi.org/10.1093/ije/dyae091

Vanderloo, L. M., & Tucker, P. (2015). Weekly trends in preschoolers' physical activity and sedentary time in childcare. *International Journal of Environmental Research and Public Health*, *12*(3), 2454–2464. https://doi.org/10.3390/ijerph120302454

Visser, K., & Van Aalst, I. (2021). Neighbourhood factors in children's outdoor play: A systematic literature review. *Tijdschrift voor Economische en Sociale Geografie*, *113*(1), 80–95. https://doi.org/10.1111/tesg.12505

Wang, C., & Burris, M. A. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior*, *24*(3), 369–387. https://doi.org/10.1177/109019819702400309

WHO. (2018). Global action plan on physical activity 2018–2030: More active people for a healthier world.

Zarotis, G. F. (2020). The importance of movement for the overall development of the child at preschool age. *Journal of Advances in Sports and Physical Education*, *03*(2), 36–44. https://doi.org/10.36348/jaspe.2020.v03i02.003