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The Potential of Green Schoolyards for Healthy Child Development: A Conceptual Framework

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Abstract: To provide children more opportunities to interact with nature, an increasing number of schools are 'greening' their schoolyards by including abiotic and biotic elements such as vegetation, sand, water, logs, and stones. Although the value of these green, nature-rich schoolyards is increasingly acknowledged, research has focused on a narrow set of child development outcomes. This paper presents a conceptual framework that gives insight into the potential short- and long-term benefits of green schoolyards related to children's physical, cognitive, social-emotional, and moral development, and the pathways through which they may occur. We argue that a green schoolyard can facilitate diverse behaviors and activities, provide sensory and embodied nature experiences, provide a restorative environment, support biodiversity, and provide a resilient environment that supports climate resilience and mitigates environmental nuisance. These five functions of green schoolyards can act as pathways to help foster healthy child development. In doing so, the framework provides guidance for future research. Although more research is needed to validate the conceptual framework, it seems that through the proposed pathways, green schoolyards can be a promising nature-based intervention to promote healthy child development.

Keywords: outdoor classroom; green space; play

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1. Introduction

As a result of increasing urbanization [1], the rise of sedentary pursuits [2–4], safety concerns [5], and the excessive planning of children's lives [6], children nowadays spend considerably less time interacting with nature than previous generations [5,7,8]. At the same time, a growing body of evidence suggests that interaction with nature is positively related to aspects of healthy child development [9,10]. Child development is a fluent process that relies on the balance and interconnection between the physical, social-emotional, cognitive, and moral development areas [11]. Systematic reviews have suggested that contact with nature can contribute to all these areas. With respect to physical development, systematic reviews have suggested that nature contact is positively associated with improved motor skills, physical health, and physical activity [12–14]. With respect to social-emotional development, systematic reviews have suggested that nature contact is positively associated with improved mental health, mood, pro-social behavior, self-regulation, and self-esteem [12,13,15–17]. With respect to cognitive development, systematic reviews have suggested that nature contact is associated with cognitive play behaviors, attention, and cognitive functions [12–14,17]. Nature contact may even contribute to moral development, as pro-environmental behaviors might be seen as an indicator of morality [18–20], and nature contact can be a pathway to pro-environmental behaviors [21,22]. Given these

benefits for healthy child development, the loss of direct experiences with green spaces and other sorts of natural environments may thus have detrimental consequences.

To provide children more opportunities to interact with nature, an increasing number of schools are 'greening' their schoolyards. A green schoolyard is a nature-rich schoolyard that contains a selection of natural, biotic and abiotic, elements and objects, such as sand, water, vegetation, logs, stones, or a lawn [11,12], which challenge children to learn and play in and with the natural elements [13,14]. A green schoolyard is a nature-based intervention implemented at school grounds, which is consciously designed to connect children with a nature-rich environment and/or to support local climate and ecology. Given that all children spend a large share of their time at school, starting already from an age of 3 years at preschool, 'greening' schoolyards helps to ensure that all children are exposed to nature [15,16].

The systematic review by Bikomeye et al. [17] already suggested that green schoolyard interventions can contribute to physical activity and socio-emotional health outcomes in children [17]. Although these conclusions are promising, the value of green schoolyards may go beyond the portrayed benefits. If the benefits of green schoolyards are equivalent to those attributed to living in a nature-rich environment and nature play [16,18,19], they may have tremendous implications for healthy child development. Current conceptual frameworks linking nature with human health, e.g., [20–22], may help to further unravel the potential of green schoolyards. However, these frameworks do not focus on child development, children's main activities, or the school context. Another resource that may help to further unravel the potential of green schoolyards is the research agenda proposed by Stevenson et al. [15]. However, this agenda does not give insight into how the effects come about; it primarily focuses on outcomes that validate the business case to policymakers (e.g., cost–benefit analyses, teacher retention, and community well-being), and it is less focused on the premise of children.

In an attempt to provide more insight into the supporting functions and the related hypothetical benefits that green, nature-rich schoolyards can have for the healthy development of children, this paper presents a conceptual framework. The conceptual framework describes how green schoolyards at preschools and primary schools can hypothetically support short- and long-term child development outcomes. With this paper, we aim to further improve the understanding of the potential benefits of green schoolyards and to outline a road ahead.

2. Conceptual Framework

The conceptual framework identifies five values of green schoolyards that act as pathways to healthy child development. (Figure 1). In the development of this conceptual framework, the starting point was healthy child development. We first examined what aspects are important for healthy child development, such as the importance of play and learning (not described in detail in this paper). We then examined how nature-rich environments and schoolyards can contribute to these aspects. We drew from literature (e.g., books, research papers, and literature reviews) from various disciplines ranging from developmental psychology, and pedagogy, to environmental science; influential theories (e.g., affordances, restoration theories, and biodiversity hypothesis); and earlier frameworks describing how the physical environment can influence health and child development [20–23]. We compiled this work and then theorized how green schoolyards can impact healthy child development.

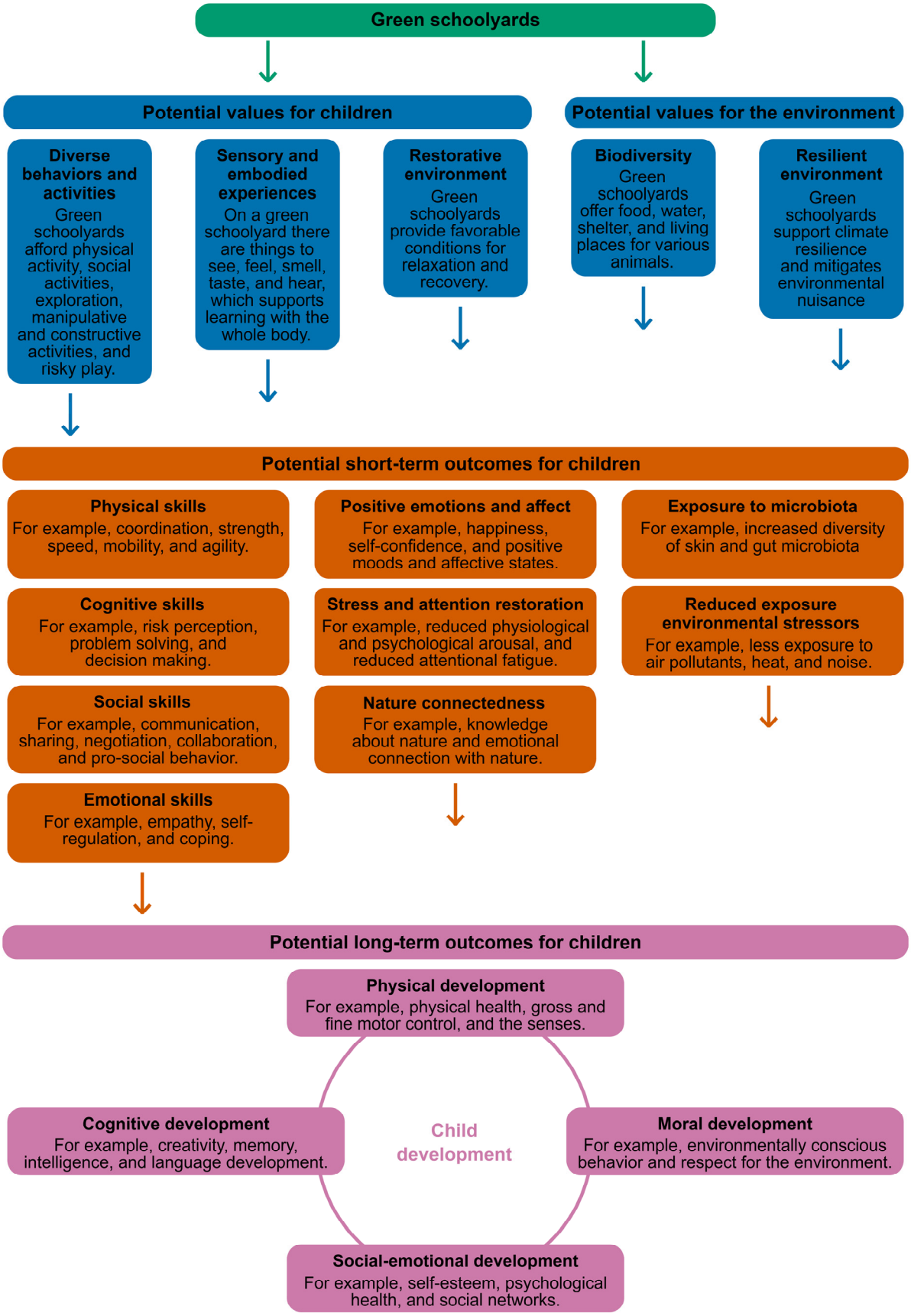

Figure 1. Conceptual framework explaining how green, nature-rich schoolyards can contribute to child development.

The five pathways of the conceptual framework include facilitating diverse behaviors and activities, providing sensory and embodied nature experiences, providing a restorative environment, supporting biodiversity, and supporting a resilient environment (e.g., climate resilience and mitigating environmental nuisance). These five pathways are called upon during three types of main exposures that fit the functions of a schoolyard: free play during recess and outside school hours; during curricular teaching or activities guided by pedagogic staff or teachers; and indirect exposures from (classroom) window views. The five pathways are not likely to operate in isolation. Rather, they may be intertwined and reinforce each other. For example, during recess, a child can be physically active while building a den and, at the same time, experience sensory nature interactions and restorative feelings, while also encountering a biodiverse and resilient environment. Suggesting that one interaction can potentially influence multiple developmental outcomes. At the same time, the interaction between different pathways might intensify a specific outcome. For example, both pathways—diverse behaviors and activities and restorative environment—can potentially contribute to improved mood.

The conceptual framework also presents potential short-term outcomes for children, ranging from learning or developing certain skills to positive affect and health indicators. We argue that these short-term outcomes can potentially benefit child development in the long term because child development is a fluid process. Development relies on the balance and interconnection between the developmental areas and is shaped by many physical health and many social, cultural, and environmental factors [24].

3. The Five Pathways

3.1. Pathway 1: Diverse Behaviors and Activities

A first pathway through which green, nature-rich schoolyards can support healthy child development is by facilitating a variety of behaviors and activities during free play and teacher-guided activities. Previous studies have suggested that children engage in more diverse play and activities at green schoolyards than at conventional schoolyards [25–29]. It has been suggested that children display diverse activities in green schoolyards because they offer a wide range of affordances. Affordances refer to the functional properties of the physical environment perceived by the child according to its needs and abilities [30,31].

Green schoolyards can offer affordances for children's play, learning, and behaviors [32] because of four main reasons. First, they offer a variety of loose natural materials (e.g., branches, chestnuts, logs, rocks, leaves, and wood) and sometimes also non-natural loose materials (e.g., pots and pans, ropes, crates, or barrels), which children can arrange, modify, and use as tools, props, or treasures [33]. The function of these materials is not pre-determined, which allows children to use their own creativity to give the materials purpose and function [34]. Second, green schoolyards offer loose, moldable elements such as sand, water, and mud. The functions of these elements are also not pre-determined, and they can take on different forms and react differently when touched or played with. In doing so, such elements encourage varied, responsive, and sensory activities, such as pouring, molding, smearing, and kneading [31,33]. Third, the vegetation and natural elements in green schoolyards can be diverse in form, color, and texture, which change with the seasons and weather conditions [33,35]. This allows for reactive and changing play and learning opportunities. Fourth, green schoolyards often offer various types of landforms, which also afford a variety of activities, such as climbing, running, symbol play, and manipulation play [31,36]. In the next sub-sections, we describe the most often reported activities and behaviors in green schoolyards and their potential for healthy child development.

3.1.1. Physical Activity

During recess play and schoolyard-based learning, children can be physically active [37]. It is well known that being physically active at a younger age has short-term benefits for physical skills such as coordination, motor skills, and strength and longer-term

benefits for cardio-metabolic health, cognitive development, and several other health and development outcomes [38,39]. A first study showed that children who had access to a forest area in their schoolyard showed greater improvements in motor skills than children who did not [40]. In addition, several studies have shown that children in green schoolyards displayed more moderate to vigorous physical activity [41–45] and less sedentary behavior [41,46] than children in conventional schoolyards. It should, however, be noted that there are also studies that did not find meaningful differences in physical activity between green schoolyards and standard schoolyards in their overall study sample [12,47–50]. Some of these studies did find moderating effects of gender or age. Their results imply that green schoolyards offer more affordances to be physically active than standard schoolyards for girls [12,41,48,51,52] and younger children [26,46,47].

3.1.2. Social Activities

Green schoolyards can facilitate a variety of activities children can do together, such as building a den, making assignments, or helping each other navigate the terrain [53,54]. Several theoretical models recognize the importance of peers and the social school environment in child development [55–57]. When children do activities together, they must communicate expectations, rules, and objectives. In the short term, this helps them to acquire several social and emotional skills such as pro-social behavior, negotiation, teamwork, leadership, docility, and sharing, and it can teach them how to cope with expectations and social norms, which in the long term will aid in their social-emotional development [58,59]. Studies have suggested that in green schoolyards, children display pro-social behaviors, positive social interactions, and collaboration during play and learning [46,47,50,60,61]. Intervention studies have further shown improved social support, improved prosocial behavior, reduced anti-social behavior, fewer peer problems, and less bullying in schools with a green schoolyard than with a conventional schoolyard [12,46,49,50,62,63].

3.1.3. Exploration

Green schoolyards can offer a variety of opportunities to discover, explore, investigate, and experiment [64–66]. Theorists, e.g., [67,68], have suggested that exploration is key to learning and development. Children's curiosity encourages them to use tactile experiences, observations, and consultation to gain new experiences or information about themselves, the world around them, or the problems they are facing [69,70]. Observations among preschool and primary school children have shown that materials such as stones, branches, shells, or feathers in green schoolyards can afford exploratory play and exploration [27,28,53,71,72]. Teachers from five primary schools further reported that when lessons took place in a green schoolyard, children kept experimenting and were enthusiastic about their discoveries [61].

3.1.4. Manipulative and Constructive Activities

The loose elements in green schoolyards can promote constructive and manipulative play and activities, such as building dens and sandcastles [27,73]. Manipulative and constructive activities are activities aimed at manipulating objects, to create or construct something, and they involve tactile experiences, engagement, concentration, and attention to the process and outcomes. In the short term, this teaches children specific physical skills (e.g., scooping, digging, or balancing objects), and it teaches them to solve problems (e.g., finding a solution for the hut that keeps collapsing). If these experiences are successful, they can contribute to a sense of competence and control in children and help develop positive self-esteem [74,75]. Observations in green schoolyards have shown that preschoolers demonstrate manipulative and constructive play more often and for a longer period than on standard playgrounds [25]. Video observations of primary school children have shown that boys showed somewhat more constructive play during recess after the renovation of conventional schoolyards into green schoolyards [28].

3.1.5. Risky Play

Risky play can be defined as thrilling play, which can involve dangerous elements (e.g., fire, water, or insects), high elevation, high speed, dangerous instruments (e.g., gardening tools), rough and tumble, or a chance of getting lost [76]. Risk-taking and overcoming challenges teach children about risk perception and body awareness and are associated with improved physical activity, less sedentary behaviors, and improved social health [77–82]. Observations at early childhood education centers have shown that—next to other non-natural structures—natural elements such as trees, wood, rocks, sticks, hills, cliffs, and water promote spontaneous risk-taking and risky play experiences [83,84]. Although, a study examining the effects of a regeneration of an outdoor space at an early childhood education center did not observe more risky play [49].

3.2. Pathway 2: Sensory and Embodied Nature Experiences

A second pathway through which green, nature-rich schoolyards can support healthy child development is through the provision of sensory and embodied nature experiences. Green schoolyards are sensory-rich environments that allow for visual, tactile, auditory, olfactory, vestibular, gustatory, and proprioceptive stimulation. Observations suggest that children pursue meaningful sensory and embodied nature activities in green schoolyards, such as building with sand, splashing, smashing, tasting, and observing [53,72,85].

Especially for younger children, sensory stimulation is important to develop various cognitive and physical skills and to learn how to respond effectively to different inputs. By providing children with a rich sensory environment, they get to know their body, structure of objects, and their environment, and they form an idea of what they like and do not like [86,87]. Not only our senses but our whole body is involved in our learning and development. Theories of embodied cognition and embodied learning argue that knowledge and cognition are not merely shaped by our brains but that sensory and motor experiences are essential to learning [88,89]. Children learn by gaining, observing, reflecting, and experimenting with and on tangible events [90]. Because green schoolyards offer things to see, feel, hear, smell, taste, and experience, they offer an interesting learning environment. According to Biesta [91–93], education is not solely about transferring knowledge and skills; it is also about giving children the time to meet the world and themselves in relation to it. Green schoolyards can help bring the world within reach since the consequences of actions and life can be experienced and seen, both in a positive (e.g., changing of the seasons or birds nesting) and negative way (e.g., dying plants or rotting vegetables).

The sensory and embodied nature experiences can also be a pathway towards nature connectedness [94–96]. According to the assessment framework of Giusti et al. [97], engagement of the senses is one of the most important elements to foster children's nature-connectedness in natural environments and nature-based activities. Nature connectedness is seen as an important driver of pro-environmental behavior in childhood and later life [95,98–100] and has been associated with improved well-being in adults and children [101–103]. Furthermore, staff of an early childhood education center observed that the green, nature-rich schoolyard afforded multi-sensory experiences, nature exploration, diverse play, and physical activity, which allowed for embodied experiences, learning practical skills, and developing a relationship with nature [71]. Furthermore, primary school teachers observed that lessons in green schoolyards can foster children's respect for nature and environmental involvement [61].

3.3. Pathway 3: Restorative Environment

A third pathway through which green, nature-rich schoolyards can support healthy child development is through the provision of a restorative environment. The mechanism behind psychological restoration is most often explained by the influential stress reduction theory [104,105] and attention restoration theory [106,107]. Stress reduction theory holds that interaction with nature-rich environments triggers an innate, positive affective response. This affective response in turn influences physical and psychological functioning

related to relaxation and helps reduce negative thoughts and moods [104,105,108]. Attention restoration theory explains restoration as a process in which an individual recovers the direct attention resources. The directed attention resources—needed, for example, to focus on school tasks—may become exhausted, which may lead to errors, difficulty concentrating, irritability, and other symptoms of mental fatigue. Attention restoration theory argues that nature-rich environments and natural elements engage attention in an effortless manner, which allows the directed attention resources to rest and restore [106,107]. These theories are succeeded by advanced propositions that further explain the restorative benefits of nature. A promising proposition is the perceptual fluency account [109–111], which suggests that nature contains fractal patterns that prompt positive affect and attention.

Following these theories, previous studies have shown associations between green schoolyards and positive emotions and affect, stress reduction, and cognitive benefits. Greater self-perceived restoration has been reported in primary school children in green schoolyards compared to standard schoolyards [112,113], and in schoolyards with a higher volume of vegetation [114,115]. In addition, primary school children also reported that green schoolyards have benefits for themselves (e.g., helping to feel calm, energized, and a good place to learn and play), which were mostly influenced by teacher-led activities in the schoolyard and by looking at and playing with plants [116]. A cross-sectional study showed that fifth-grade students who attended schools with a higher percentage of grass/shrub cover were less likely to display externalizing behavior [117]. Another study found improved self-regulation with greater exposure to 'green' outdoor classrooms and green spaces in and around the schoolyard [118]. Additionally, an intervention study suggested that children from an early education center showed less depressive feelings after green schoolyard renovations [49].

With respect to cognitive benefits, systematic reviews have found moderate evidence for the association between green space around schools and academic performance [119–121]. Specifically, in green schoolyards, preschool staff observed fewer behaviors of inattention in children who played in outdoor areas that contained large areas of trees, shrubbery, and a hilly terrain [122]. Intervention studies have shown that primary school children who played on a green schoolyard during recess performed better on an attention task after recess than those who played on a conventional schoolyard [12,112]. Moreover, studies have shown that teachers give fewer redirections [123], children display better subsequent classroom behavior [124], and children have better knowledge retention [125] when taught in a 'green' outdoor classroom compared to an indoor classroom.

3.4. Pathway 4: Biodiversity

A fourth pathway through which green, nature-rich schoolyards can support healthy child development is through the facilitation of biodiversity. Biodiversity includes the variety of different species such as bacteria, insects, animals, and plants (e.g., trees, herbs, or grass), variety within species, and the variety of ecosystems [126,127]. The loss of biodiversity as a result of urbanization, increased agriculture, and other forms of land conversion in the last few decades [128] threatens not only plants, animals, and microorganisms but also processes related to food security, shelter, water availability, and quality, as well as climate stability. In fact, biodiversity underlies many ecosystem services that are essential for human well-being [129]. Biodiverse ecosystems are therefore essential, even in urban areas. Green schoolyards can contribute to this by forming a habitat for birds, small mammals, insects, and other invertebrates by providing food, shelter, and a living environment [130–132].

Biodiversity is not only important for the livelihood of the environment but may also directly contribute to human health and well-being [22,133–135]. Particularly the interrelatedness of biodiversity—or lack thereof—and certain allergies and respiratory problems have been topics of attention [136–140]. This may be explained by the biodiversity hypothesis [134,141], which connects and adds to the hypotheses of 'old friends' [142], 'hygiene' [143], and 'microbial deprivation' [144]. According to the biodiversity hypothesis,

reduced contact with nature-rich environments with diverse macro- and microbiota, in combination with unhealthy lifestyle behaviors, can negatively affect the assembly and composition of the human microbiota. Consequently, this can lead to immune dysregulation and poor tolerance, which may ultimately lead to clinical disease [134].

The biodiversity in green schoolyards may help optimize students' health and development [145]. A study showed that children who attended an early childhood center in which biodiversity was enhanced using vegetation and natural surfaces showed more diverse skin and gut microbiota after 28 days compared to children not attending these centers. These more diverse skin and gut microbiota were associated with more favorable blood markers in the children who attended the biodiverse early childhood center [146]. Another study among primary school children showed that 45 min exposure to a forest amplified skin microbiota diversity compared to children exposed to a classroom or school sports field [147].

3.5. Pathway 5: Resilient Environment

A fifth pathway through which green, nature-rich schoolyards can support healthy child development is by providing a resilient environment. The large-scale planting of vegetation and the presence of natural soils in green schoolyards can contribute to local climate resilience as they can help mitigate heat [148], mitigate and manage heavy rainfall through water infiltration, rotation, and storage in the soil, and slow rainfall run-off through vegetation [149]. In addition, it can help mitigate environmental nuisances associated with urban living [150], such as the reduction in air pollution [151] and noise [152]. This aids the local environment and can also benefit three aspects of child health.

First, green schoolyards may contribute to thermal comfort [153]. Built and paved surfaces in urban areas absorb solar radiation and emit the absorbed energy to the environment as thermal radiation, resulting in an increase in temperature in that environment, the urban heat island effect [154]. Green areas do not have this effect; therefore, they can limit the buildup of heat islands in urban areas at the city level [148,155]. On a local level, they create cooler areas through shading and evapotranspiration. Thermal comfort has been associated with physical activity and learning outcomes: studies have shown that on hotter days, children move less during recess [45,156,157] and achieve less on standardized tests [158–160].

Second, densely planted vegetation in green schoolyards can reduce the transport of polluted air and remove air pollutants [151,161], which can result in lower indoor and outdoor air-pollutant concentrations around schools [10,162]. In turn, lower levels of air pollutants around schools may improve children's health [163–165], cognitive development [10,166,167], and school attendance [168].

Third, dense green plantings in green schoolyards may help shield children and teachers from environmental noise. Environmental noise can have a negative impact on several aspects of human health [169]. Vegetation can reduce direct exposure to noise through absorption, interference, and diffraction of sound waves [152]. Additionally, the restorative features of nature-rich areas can have a beneficial effect on noise perception [170,171].

4. Future Directions

This paper presents a conceptual framework that describes how green, nature-rich schoolyards at preschools and primary schools can potentially support healthy child development. It presents five values of green schoolyards that can act as pathways to healthy child development and provides an overview of potential short- and long-term benefits related to the physical, cognitive, social-emotional, and moral developmental areas. The presented conceptual framework contributes to and complements existing frameworks on the relationship between nature and health, [20–22] and the research agenda of Stevenson et al. [15] as it specifically focuses on the school context, children's activities therein, and child development.

It seems that research on the possible benefits of green, nature-rich schoolyards and their underlying functions is still in its infancy, with most research focusing on physical activity and social-emotional health outcomes [17] The presented five pathways and their potential benefits were derived from studies on the effects of green schoolyards and from more indirect evidence from the fields of geography, pedagogy, and developmental psychology. In doing so, it presents a range of new directions. For example, it seems that little is still known about how sensory and embodied nature experiences in green schoolyards affect children's physical, cognitive, and emotional skills, and longer-term outcomes. The range of potential benefits outlined in our theoretical model could help to better understand the value of green schoolyards. Furthermore, investigating the mediating role of the presented pathways could help accelerate the growth of knowledge.

It should be noted that the conceptual framework does not take contextual or modifying factors into account. It seems too early for such endeavors. We do know that green infrastructures and green schoolyards tend to be unequally distributed. Schools with more green infrastructures (e.g., tree cover) around their premises are generally located in the wealthiest neighborhoods [172,173] or at schools with more 'privileged' youth [174]. In addition, schools in poorer areas have more difficulties acquiring funds for greening their schoolyard, generating skills and capacity among employees within their limited budget, and acquiring parental support for the implementation of green schoolyards [175].

It may be that these unequal distributions amplify existing health disparities because previous research has suggested that the benefits of green spaces are most pronounced among residents of socio-economically deprived neighborhoods, e.g., [176–178]. Future research should therefore examine how this and other geographical, cultural, and educational factors might influence how green schoolyards are used, perceived, or experienced. Such insights will help us gain a more complete understanding of the potential of green schoolyards.

The empirical evidence about green schoolyards summarized in this paper includes experimental studies, e.g., [124]; questionnaire studies, e.g., [113]; observation studies, e.g., [50]; and qualitative studies, e.g., [61]. Although no systematic searches were performed to assemble this evidence, it does give an indication of how interdisciplinary current work is and that patterns are examined using various research designs. The work of Bikomeye et al. [17], however, does suggest that intervention studies are lacking because they only discovered six green schoolyard intervention studies with systematic searches in 2021. We recommend setting up longitudinal, intervention studies that assess development outcomes over time. Such work will give insight into the longer-term and causal impact of green schoolyards on child development.

The five pathways only function if green, nature-rich schoolyards are optimally designed. The five pathways thus also give input for the design of green schoolyards. The framework suggests that green schoolyards ideally should encourage a variety of behaviors and activities, allow for sensory and embodied nature experiences, provide a restorative environment, support biodiversity, and contribute to the local climate. To further support the design of green schoolyards, more insight into effective landscape elements is needed to understand what types of landscape elements support these five values and ultimately healthy child development.

To fully exploit the potential of green schoolyards for healthy child development, they have to be used. So far, most studies seem to have focused on the effects of recess play or the mere presence of green schoolyards. Considerably fewer studies have reported on the effects of using green schoolyards as outdoor classrooms. If green schoolyards are used for more educational purposes, this may enhance children's contact with nature, and benefits may accumulate. We recommend conducting more research on the effects of teacher-led activities in a green schoolyard on children's learning and developmental outcomes.

5. Conclusions

In light of the positive effects of nature on child health and development, initiatives that increase the accessibility of nature deserve support. Green, nature-rich schoolyards may be such an initiative. This paper presents a conceptual framework that gives insight into the potential benefits of green schoolyards related to children's physical, cognitive, social-emotional, and moral development and the pathways through which they may occur. The framework centralizes children and what characterizes them—playing and learning—and recognizes that healthy development relies on the balance and interconnection between physical, social-emotional, cognitive, and moral development areas [24]. The framework places and specifies knowledge about the relationship between nature and child health and development within a narrower context, but with potentially high impact: a green, nature-rich schoolyard can be a rich educational space that contributes to healthy child development during and beyond the school day. Additionally, the assembled scientific work described in this paper suggests that green schoolyards can support healthy child development and also help solve several social dilemmas, including mitigating climate change and increasing biodiversity.

The aim of this paper was not to assess the state of current literature or discuss the strength of the evidence. Rather, we aimed to provide a full understanding of the potential of green schoolyards to inspire other researchers to focus on a broader range of outcomes. This may help shape practice and policy recommendations in the future, and it may help convince schools, parents, communities, funding agencies, and policymakers of the many values green schoolyards can offer for children's healthy child development as well as local ecology. Although the conceptual framework needs to be validated in future research, it is a first step in improving the functional understanding of the potential of green schoolyards for healthy child development.

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