Chapter

Outdoor Recreation within the School Setting: A Physiological and Psychological Exploration

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Abstract

School recess is a crucial outdoor recreation period to develop health behaviours such as physical activity, social and thinking skills that can track into adulthood. As students in some schools can be immersed in playground recreation opportunities via up to 4200 school breaks during their schooling (three times per day, 5 days per week, 39 weeks per year, 7 years of primary school), the school playground has become an emerging focus for researchers to facilitate important health outcomes. Outdoor recreation activities during school recess can contribute up to half of a child's recommended physical activity participation. Ensuring there is an enhanced understanding and awareness of what can enhance or hinder outdoor recreation activities within school contexts is therefore important to develop both physical and psychological strategies to help promote sustainable health outcomes. Despite outdoor recreation during school recess periods being a vital setting to develop physical, social and cognitive habits, the possibilities during this period have only started to gain momentum in the first two decades of the twenty-first century. This chapter will outline the important link between school playgrounds for outdoor recreation during school recess and the various physiological and psychological effects that have been revealed from various strategies that have been implemented for children with typical and atypical development.

Keywords: school playgrounds, recess, physical activity, psychological wellbeing, health

1. Introduction

Schools are widely acknowledged as a vital setting to develop a child's physical activity participation [1], with a comprehensive review from over 25 years discovering the positive links between a child attending school and participating in greater levels of physical activity [2]. Not only is the school context where children spend the majority of their time each week (+ 30 hours in many cases), but the school is also a resource full of outdoor recreational options for children to develop physical activity, cognitive and social habits. Such outdoor recreational pursuits could include non-curricular (e.g., after school, active transportation), co-curricular recreational opportunities (via recess, school sporting carnivals) and curricular programs (via outdoor learning/recreational programs). The importance of these outdoor recreational settings in school become underscored by the continual

reductions in the ability of children to experience opportunities to play around the home and neighbourhoods (e.g., concerns of neighbourhood safety, pollution, restrictions and non-play values at home) [3, 4]. Moreover, it is vital that a child experiences a multitude of opportunities to be physically active during school recreation to meet national activity guidelines. International guidelines recommend children participate in 1 hour of moderate to vigorous physical activity (e.g., activity which makes you sweat and puff) to develop positive physical activity habits to protect against chronic diseases such as Type 2 diabetes, cardiovascular disease and osteoporosis [5].

In addition to the physical benefits that can be derived from outdoor recreational strategies within schools, research over the past two decades continues to unveil the interconnections between both the body and the mind [6]. For example, Santrock [7] makes the statement "biological processes can influence cognitive processes and vice versa ... we are talking about the development of an integrated individual with a mind and body that are interdependent" (p. 16). The brain is one of the busiest organs in the human body by processing around one fifth of the body's metabolism during cognitive processes. Therefore, it should be no surprise that cognitive processes require a steady stream of oxygen and energy from physical activities to meet such mental demands [8] and why sedentary pursuits of sitting/standing should be avoided to ensure that mental demands are optimally catered for [9]. So if a child is undertaking vigorous outdoor recreational pursuits at school, it is expected that a child's capacity to be able to remember, perceive, concentrate and attend to academic tasks should be improved [6].

This chapter will begin by discussing how children can be physiologically effected from outdoor recreation in schools. The discussion will commence with an exploration of both structured (e.g., a set purpose, location) and unstructured (e.g., less pre-determined purpose) playground strategies during school recess. The discussion continues with exploration into before- and after-school outdoor recreational strategies that have been introduced to influence school children's physical activity participation and development. The next section considers the psychological context of recess, before detailing the specific and intersecting dimensions of children's cognitive and social development during outdoor recreation in schools. Finally, an overview is provided with key insights that have emerged from the literature in relation to the physiological and psychological effects that have been measured within outdoor recreational school contexts.

2. Physiological effects from outdoor recreation in schools

The provision of a catalogue of outdoor recreational opportunities in schools is vital to ensure that children develop healthy habits and strong minds to take with them into both adolescence and adulthood [1, 10]. The impact and level of quality of earlier life experiences in physical and recreational pursuits often tracks into adulthood [11, 12]. Despite physical activity options being required to be delivered in various capacities of the school system, research continues to recognise that children will engage or prefer to engage in more sedentary-type behaviours of sitting and standing [13]. Large proportions of children exceed national screen time recommendations [14] and not meeting child physical activity guidelines has become the norm across most countries worldwide [15, 16]. For instance, a major international report on adolescent physical activity participation from decades of population data revealed that in most countries, just one (lowest) or two (highest) out of 5 children will meet national physical activity guidelines [17]. These guidelines are designed to ensure children are optimally healthy to prevent disease.

Despite such dire health results, there has been continual research to try and promote positive outdoor recreational strategies in schools to have an impact on school children's physical activities. With the positive links of physical activity participation on biological improvements well established [18, 19], most research focusing on the physiological effects from outdoor recreation in schools has been concerned with improving physical activity levels [20].

2.1 School playground recreational strategies to develop school children's physical skills and habits

The school playground during recess is a powerful outdoor recreational school context to enhance children's physical abilities. The school playground has a combination of supervision, access and safety which allows wide ranging physical activities for children [10]. In many jurisdictions, the school playground during recess time has become the main option for children's physical activity participation, as PE time allocations have been reduced and eradicated [21]. Earlier work researching the impact of children engaging in school playgrounds during recess has suggested that almost half of a child's daily physical activity is sourced from the school playground [22]. The importance of discovering customisable strategies within the school playground recreational context is therefore vital.

There have been a number of strategies trialled within school playgrounds during recess to improve outdoor recreational activity levels such as themed activity weeks, providing games equipment, loose parts, surface markings, fitness ideas and providing more natural features [20]. Most of these strategies have been successful on participation levels from short-term measurements, which is likely due to the novelty of introducing new strategies compared to constant playground agendas and the desire from the children to expand their play options with variety [10]. Themed activity weeks of having alternating weeks with an obstacle course, frisbee activities, fitness circuits and a week with normal activities is one of the playground intervention packages mentioned [23]. This alternating recreational strategy unveiled that physical activity participation levels were greatest during the two weeks in which the children participated in a fitness themed week or their normal playground activities. Fitness-focused playgrounds during recess have also had a positive impact on children's physical activity levels compared to recess periods with no set playground agenda being implemented [24]. The implementation of games equipment with providing activity details and instructions for a range of games and activities for the children to perform in the school playground has also been introduced. Scholars discovered that providing the game cards increased the physical activity levels in the school children [25]. The implementation of other recreational games have also had success on children's physical activity levels such as via interactive bowling and running games [26], alongside games offered by trained staff in recreational sports [27] such as in softball, tag, basketball and relay games. The painting of school surfaces with markings [28–31] to encourage the outdoor recreational pursuits with jumping lines, board games, agility snakes and hopscotch have seen the physical benefits of energy expenditure increases (can help with obesity), duration engaged in physical activity, improved compliance with national physical activity guidelines and overall increases in the intensity of a child's physical activity participation over a 2 year period. Moreover, combining a range of strategies such as training staff to facilitate children's activities within the school playground, breaking up the playground into activity zones (e.g., soccer, tag games) and the introduction of loose sporting equipment (e.g., balls, markers) have had a positive impact on the intensities children's engaged in their outdoor recreational activities at school [32]. Additionally, even the simple redesign of playgrounds for outdoor recreation

with equipment such as climbing structures, slides, and a spinning apparatus have had a positive impact on children's physical activity levels [33] or reducing sedentary behaviour [34].

Less structured recreational strategies without a set location, time or purpose have been found to have quite holistic benefits on children's physical health. For instance, these strategies have simply involved getting rid of school playground rules/regulation, providing more natural features (such as rocks, trees, gardens) and implementing sparable, movable household items known as loose parts. Although not directly measuring physical activity participation, a New Zealand primary school principal reported on the amount of new physical activities taking place for children's physical development when he removed excess school playground rules and regulations [35, 36]. The Principal described how the allowance of play which was perceived as more risky unlocked a variety of physical activities such as climbing structures like hand rails and trees, skating across hard surfaced areas and sliding in the mud. Moreover, the Principal noticed a dramatic reduction in physical injury from providing more play freedom. The recreational pursuit of climbing can have a multitude of benefits on a developing child, including muscular strength, endurance and flexibility [37]. Although tree climbing is perceived by many as being risky [38], the introduction of features such as trees, rocks, gardens and grass areas has seen school children vary their outdoor recreational physical activities, enhance the amount of space and opportunities for physical activity, play freedom and have had an impact on moderate levels of children's physical activity [39–41]. By greening outdoor recreational areas in schools, the ability to improve children's self-reported wellness is also enhanced [42, 43].

Overcoming adult perceptions of risky play [44] also reignited a multitude of larger studies on the provision of loose parts on children's physical development. Most of this more modern research stemmed from Bundy and colleagues' pilot study [44] research which recognised that adults perceived loose parts materials (e.g., sticks, crates, hay bales) as too risky, yet the findings demonstrated the entire opposite in very young children. The loose parts were able to transform the school playgrounds into rich childhood developmental hubs via outdoor recreation and reigniting the momentum of loose parts from the 1970's [45]. The resulting physical activity outcomes from introducing loose parts have seen increases in primary school children's (of a range of year levels) physical activity enjoyment, intensities, steps/distance, activity types, playability, durations, complexity and many of these physical activity developments were sustained for long-term follow-up studies (e.g., 1–2½ years) [20]. The earlier findings were also supported by studies across other locations such as the United Kingdom [46] and New Zealand [47] with positive teacher reports of similar developments. Moreover, "relocatable" sports equipment are also reported to have positive effects on children's physical activity [48].

2.2 Before and after-school recreational strategies to develop school children's physical skills and habits

By investigating the school playground strategies above, it becomes clear that continuing to consider strategies which will not burden teachers' curricular commitments can be powerful on a child's physical development. It is also vital to consider a holistic approach to outdoor recreation during school days for children's physical development with additional strategies, particularly with curricular physical activity opportunities being constrained [49]. Beyond the school playground, the most prevalent outdoor recreation school avenues are through after school programs, school camps/excursions, and active transport (to and from school via movement).

After school programs typically involve collaboration between the community and the school. Internationally, there have been a number of extracurricular recreational programs, commonly focused on increasing physical activity through sports. For instance, in Hungary, physical education teachers coordinate and organise physical activities outside of school as a formal requirement [50]. In Taiwan, there are opportunities for children to connect, learn from and interact with adults from training institutions in how to undertake and participate in sports [51]. The Australian Sporting Schools program has been a significant recreational strategy introduced to schools which has been intended to increase children's participation in local sport with the delivery of programs by a national sporting organisation [52]. Whilst many of the after-school and extracurricular programs which are implemented worldwide have little research data showcasing program effectiveness, the reach of the Sporting Schools program from 4000 [53] to almost 7500 schools [54] nationwide shows some impact of the program.

Although much of the research of this chapter showcases programs to develop school children's health via outdoor recreational strategies within the school setting, it should be acknowledged that there has been some research with school children outside of schools. Summer camps for instance are highly popular in places such as Canada and the USA with large summer breaks [55]. Such camps can offer chances for outdoor recreational activities in areas of sport and adventure and have been identified as having a positive impact on school children's physical health [56], physical activity levels and meeting daily physical activity recommendations [57, 58]. Another outdoor recreational pursuit for school children is to walk or ride to school via active transportation [59]. Scholars describe active transportation as creating important physical activity habits in school children, environmentally friendly travel habits and a valuable opportunity to invigorate children's physical activity participation rates and levels [60, 61]. Although scholars caution school communities about potential safety risks such as road traffic and strangers, it is acknowledged internationally that school communities can consider programs such as a walking school bus concept in which adults lead a group of children [62, 63]. This can be achieved by considering stakeholder partnerships and the level of infrastructure and resources around a school's transportation networks to actively transport to and from school. Although this extra-curricular strategy to encourage physical activity has widespread support, there still remains a gap in the data relating to long-term insights and standardised outcome measures of physical activity [64, 65]. As detailed earlier in the chapter, if physical activity levels can be increased, this can also have a positive impact on the flow of nutrients to the brain to enhance cognitive performance. In the next section of this chapter, we unpack a range of the outdoor recreational strategies in schools which have had an impact on psychological functioning.

3. Psychological effects from outdoor recreation in schools

We begin this next section by considering the psychological context of recess before moving to specific areas of cognitive and social development. The psychological context of outdoor recreation in schools is rarely acknowledged, yet can be a major contributor to cognitive and social outcomes. One way to consider the psychological context is in terms of structure versus autonomy (e.g., ensuring more choice in how things are done). Structure can be imposed in a variety of ways including clearly articulated rules negotiated with children through to non-negotiable top-down rules or quick decisions by teachers on duty during recess regarding the rule boundaries and positive or negative play [66]. An increase in banning of activities that children consider to be fun has been found in a large UK

study [67] and is likely to extend to other countries given the heightened concern expressed by teachers about risky play during recess [44, 68]. Teachers often face the dilemma of allowing children more autonomy or acting in accordance with their perceived duty of care which can involve imposing excessive rules and safety requirements.

Structure has sometimes been introduced as a means of increasing physical activity. There is speculation that an emphasis on sports and other structured physical activity can change the social hierarchy of the playground, elevating the status of children with better physical skills [69]. It is possible that high levels of structure to achieve physical activity outcomes may have a negative impact on children's autonomous decision making and social interaction processes. With less choices and opportunities for decision making during play, children suggest such restriction can cause boredom, misbehaviours (and injury) and a desire to lash out during school recess periods [70].

Many researchers and teachers argue that children need more elements of choice from the psychological component of autonomy to learn life skills. It is known that recess times are some the best times to offer such opportunities with minimum structure or intervention. As noted previously, loose parts have been offered to children during recess as a means of promoting physical activity through imaginative play. One of the adult-perceived difficulties with loose parts play is the potential for accidents and injuries. Interestingly, both parents [71] and teachers [72] seem to have a lower tolerance for risky play when a child has a disability. Interventions involving loose parts have helped to overcome many of the concerns related to risky play. Some interventions have included risk-reframing workshops to support shifts in thinking of teachers and parents about risks in play [73]. Interventions without these workshops have also succeeded in shifting adult behaviour from enforcing playground rules to granting children greater autonomy to make decisions about their play [47]. Hyndman and colleagues discovered that the introduction of loose parts can help facilitate outdoor school recreation activities which aligned with both national curriculum objectives [74] and key criterions of creativity [75]. This was achieved by encouraging children to learn and undertake more complexity with their recess activities with loose parts equipment. Loose parts have also been reported by teachers to have a positive impact on children's cognitive engagement during outdoor recreation activities [76] with impacts on short-term enjoyment levels [77], a key psychosocial influence for sustained participation.

Other interventions have provided more explicit play goals, but these have been negotiated with school personnel and children. The Health Active Peaceful Playgrounds for Youth (HAPPY) intervention [78] is an example of this type of approach. Some children were offered specific training relating to physical activity and social inclusion with peers. Children in this study were found to value clear rules for games that were known to all children. It is perhaps the arbitrariness of rules in some contexts that causes difficulties for children. For example, a staff member in one of the loose parts studies [46] mentioned that prior to the introduction of loose parts, children were held back by having to remember the recess rules. Emerging evidence also suggests that psychological benefits may be amplified if recess occurs in natural environments. This is mainly due to the stress-reductions experienced by children when in nature [79].

Some of the research questions regarding cognition and academic skills are relatively standard and relate to the possibility that recess provides a context for promotion and development of these skills. Surprisingly, some researchers are also interested in a null result, showing no effect. The reason for the latter interest is that time spent in recess is often perceived as time that could be better spent on direct instruction on academic tasks. Current evidence indicates that school recess does

not have a negative impact and may have a positive impact in some areas of cognition and academic achievement.

There are sound reasons to believe that short-term or habitual physical activity will promote cognitive skills with a flow-on effect to academic skills. Children's enjoyment of more vigorous recreation activities during school recess has also been linked to improved quality of life [80]. Nonetheless, results have not been as clear as expected. Recent systematic reviews [81, 82] have shown mixed results and have called for high quality studies to address this question.

Physical activity in adults has been found to promote higher order cognition known as executive functions (EF). The core EFs are working memory, inhibitory control and cognitive flexibility [83]. Performance on EF tasks is predictive of academic performance [84]. Working memory involves holding and manipulating information in memory, such as when solving mental arithmetic problems. Inhibitory control is the ability to suppress a prepotent response. In academic work, the first response that comes to mind may not be the correct one and inability to suppress competing responses may interfere with task completion. Cognitive flexibility involves the ability to shift strategies when the one used becomes unproductive. A strategy may be effective in solving simple problems, for example, but no longer works when problems become more complex. Inability to change strategy makes it difficult to progress to higher level school work.

The EFs are known to be quite malleable during childhood. Researchers have therefore attempted to understand the mechanisms that support improvements in EFs. Physical activity has been identified as a potential contributor to brain plasticity, neurogenesis and resilience to damage. This is achieved through processes such as promoting blood vessel growth that support the brain's increased energy needs [85]. Research studies have not had a clear focus on recess, physical activity and EFs. Studies that might help understand the outdoor recreation in schools, physical activity and EF relationship have not always taken place during outdoor recreation in schools. For example, the FITKids randomised controlled trial [86] took place after school, but included games, teaching of skills and other challenges that could be available during outdoor recreation in schools. The FITKids trial was conducted with 7–9 year olds, with the intervention group showing improvements in two core EFS, inhibition and flexibility. This continues to be a promising area of investigation and more studies are needed. Current systematic reviews indicate that the results of studies are mixed, but importantly no studies show a decline in EFs following increased in physical activity [87–89].

Mathematics and literacy are the most common academic areas investigated by researchers. Time spent in physical activity during recess has not been found to adversely impact academic performance [15]. This has been demonstrated in a range of studies including a large cross-sectional Spanish study with 1780 participants aged 6–18 years [90]. There are also studies that have found a positive impact of physical activity on academic skills. A recent meta-analysis of 26 studies with participants aged 4–13 years found physical activity to lead to improvements in mathematics, reading and classroom behaviour. Mathematics was also found to improve in a recess study with Grades 3–5 involving exergaming [91]. Children in this study participated in "Dance-Dance-Revolution" (DDR), which involved aerobic activity and choreographed footwork and was appealing to the participants in the study.

One hypothesis regarding the mixed findings for EFs and academic performance is that physical activity alone is not enough to promote cognitive or academic development. What is needed is the addition of cognitive or social demands [88]. For example, DDR placed pressure on memory for the choreographed steps. It is also important to note that these interventions were offered during some recess sessions (e.g., DDR was 90 minutes per week), but children also had access to free play time.

To our knowledge there are no high-quality studies of unstructured recess interventions and EFs or academic outcomes. There is potential for future research as some researchers argue that structured activity during recess may interfere with academic performance, particularly for younger children who may need a break to during recess to reduce interference with preceding and following class instruction [89].

4. The social-psychological intersections of outdoor recreation in schools

For many children, school recess is the only opportunity to engage in peer activities with minimal adult supervision. Ideally, school recess offers opportunities for children to practice social interaction skills, negotiate with others to achieve goals, form enduring friendships, support peers experiencing difficulties and learn to manage their own risk-taking behaviours. Although social time on the playground may appear to be nothing more than a break from class, the quality and quantity of social time may have important implications for psychosocial development and academic achievement. For young children, level of social interaction with peers has been found to be positively associated with academic achievement whereas level of social interaction with teachers was negatively associated [92].

Social interactions are often different for girls and boys during outdoor recess. Girls have been reported to have higher levels of enjoyment for social and imaginative play [93], alongside more time in pretend play which requires planning with peers. Boys are more likely to engage in rough and tumble play, particularly in the early school years. Rough and tumble generally involves play fighting, wrestling and other behaviours that are sometimes mistaken for aggression [66]. Rough and tumble is therefore often banned or restricted on school playgrounds. Rough and tumble is developmentally important for the development of self-control, conflict resolution and affiliation. It is a positive behavior for most children with the exception of boys with a "rejected" sociometric status for whom it can predict antisocial behaviours. It is important to note that the gender differences observed during outdoor recess in western schools may not be universal. For example, there is evidence that rough and tumble play occurs equally for both genders in forager societies [94].

The majority of school children look forward to recess time and see it as an opportunity to engage in fun activities with friends. For a significant minority of children however, recess is a time when they are isolated, rejected or bullied. Elementary school children have nominated outside recess as particularly problematic for bullying [95]. Recess should offer an opportunity to promote psychosocial development, but this is currently not true for all children. Many of the issues that contribute to negative social outcomes are the same as those that contribute to social outcomes, including poor supervision, lack of materials and lack of space [96].

Some of the difficulties children have on outdoor school playgrounds relate to the spaces available. Children typically have the choice of large open spaces that are easy for adult surveillance or seeking privacy behind buildings where they may feel vulnerable. A recent study has shown that many children prefer "in-between" spaces for at least some of their outdoor play [97]. These spaces include under staircases, under trees and edges of buildings. Importantly, these spaces maintained a visual line to the main play areas and therefore did not incur the vulnerabilities of being out-of-sight. Some children said they worried about the boisterous play on the main playground. The in-between spaces meant they were less likely to be hit by a ball or knocked over by another child. Children also used these spaces for imaginative play or to define boundaries such as goal posts. In-between spaces provided

greater opportunities for children to self-select their play and define their peer groups. Unfortunately, these spaces were often considered to be out-of-bounds.

Difficulties for children can stem from underlying psychological problems. Children with internalising or externalising disorders may have difficulties with social interactions on the playground. In recent years, social skills interventions have targeted peer interactions on the playground to support children's access to a complex social environment and with the goal of achieving the flow-on effect of improved academic outcomes [98].

Unfortunately, recess is often perceived as a privilege rather than an essential part of the school day. Consequently, there is a widespread practice of restricting or removing recess privileges from students for misbehaviour or to catch up on schoolwork [67]. Recess restriction continues to be a recommended behaviour management technique [99]. When asked, children indicate a preference for longer recess periods [67, 100]. Clearly, recess is valued by children which makes it an easy target for disciplinary practices. Children from third and fifth grade in two US schools indicated that they understood the reasons for teachers restricting outdoor recess, but largely considered it unfair and argued that it exacerbates antisocial behaviour for some children [100]. The children in this study valued the autonomy experienced during recess which included being able to run around and talk to peers about their chosen topics.

Loose parts play during outdoor recess has been hypothesised to have a positive impact on social interaction and social skills [101]. There are many reports from teachers to indicate that children's play is more cooperative and more inclusive when loose parts are introduced [76, 102]. A recent systematic review of loose parts play interventions found that high quality studies have not demonstrated significant changes in children's social competence and social skills [103]. One of the issues is that children in these studies may already be functioning well in terms of social competence and social skills [104]. This assumption is reinforced by social play often generating extremely high levels of enjoyment for children compared to other play categories [93, 105]. More research is needed to determine if children with poor social skills make improvements when negotiating with others in loose parts play and if fewer children are rejected or neglected during loose parts play.

Understanding of social development outcomes related to outdoor recess remains under-researched. There is criticism that the strong claims from authoritative organisations about the benefits of recess for social development have not been matched by strong evidence [106]. At a minimum, the current evidence suggests that outdoor recess has little impact on the social development for the majority of children. Recess is valued by children as autonomous time to spend with peers and provides teachers with opportunities to observe children's abilities to manage risks and negotiate with peers to achieve complex goals.

5. Conclusion

With the increasing burdens facing teachers (curriculum demands, professional development, student engagement/inclusion and workload intensification), it is more important than ever to ensure that there are quality outdoor recreational opportunities provided for school children. The chapter has detailed how the outdoor recreation setting during school recess is having an impact on children's physiological and psychological outcomes. Interestingly, it is clear that due to well-known biological benefits of physical activity on the human body, most physiological research investigating outdoor recreation in schools has simply focused on how to increase physical activity participation. Although a focus on participation levels

is important to help children meet physical activity guidelines in order to prevent lifestyle diseases such as Type 2 diabetes, cardiovascular disease and osteoporosis. Yet what this chapter also uncovers is the strong interlinking nature between the physical, psychological and social outcomes of health. There were clear overlaps and insights gained between investigations across health dimensions. It becomes clear that the substantial amount of time children will be exposed to during "critical windows" of recess time in schools is vital to develop positive and holistic behavioural habits. Further investigations into school recreational contexts have the potential to continue to shed light on the developmental potential and possibilities that could be achieved for outdoor school recreational settings to be prioritised and protected into the future. There are numerous key messages from this chapter. First, it is the important to maintain or extend children's opportunities for outdoor recreation during recess due to the physiological and psychological benefits of extended outdoor interactions with peers. Second, allowing time for high quality outdoor recreation during recess does not interfere with academic outcomes. Third, many changes to school playgrounds, such as introduction of loose parts, are effective in bringing about change without adding to teacher workload. Finally, children look forward to outdoor recreation during recess, it improves their overall school experience.

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