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The perceived benefits of and barriers to nature-based play and learning in South Australian public primary schools: A cross-sectional study

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ABSTRACT

Nature-based play and learning is of increasing interest to primary schools. However, few studies have investigated primary school staffs' views. Therefore, this study aimed to survey school staff about the barriers and benefits of nature-based play and learning. The online cross-sectional survey was completed by 50 respondents each representing a South Australian public primary school. Participants were mostly female (92%), educators (68%), in metropolitan schools (56%). The benefits of nature-based play and learning included 'mental health' (reported by 98% of participants), 'spending time outdoors,' 'connection to nature,' 'cognitive development' and 'risk-taking' (all reported by 96% of participants). The barriers included 'teacher knowledge and/or confidence' (68%) and 'crowded curriculum' (64%). No significant associations were identified between school characteristics and benefits and barriers of nature-based play and learning. The findings suggest that while nature-based play and learning within primary schools offers promise, barriers to uptake exist. Thus, enabling strategies should underpin implementation.


KEYWORDS

nature-based play and learning; nature play; outdoor learning; primary school

Introduction

There is widespread concern that children are not spending enough time in nature and that, as a result, they may be missing out on the potential benefits that nature has to offer (Bentsen, Jensen, Mygind, & Randrup, 2010; Chawla, 2015; Mainella, Agate, & Clark, 2011). Emerging evidence indicates that nature-based play and learning may have a variety of benefits for children's social skills, learning, physical health and wellbeing (Becker, Lauterbach, Spengler, Dettweiler, & Mess, 2017; Dankiw, Tsiros, Baldock, & Kumar, 2020; Miller, Kumar, Pearce, & Baldock, 2021; Mygind et al., 2019). Thus, nature-based play and learning may be a valuable health promotion tool with potential health, social and academic benefits for children (Maller, Townsend, Pryor, Brown, & St Leger, 2006; Mygind et al., 2019). While the evidence for nature-based play and learning is still emerging, its benefits have become widely accepted, and the interest in purpose-built nature play spaces and nature-based play and learning appears to be growing (Bentsen et al., 2010; Coe, Flynn, Wolff, Scott, & Durham, 2014; Maller & Townsend, 2006).

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Primary schools are an ideal setting to realise the potential of nature-based play and learning as a health promotion tool. This is supported by the socio-ecological approach, which is based on the idea that health behaviours are shaped by the multiple levels of influence to which an individual is exposed (Sallis, 2015). These include individual, interpersonal (such as family and peer relationships), organisational (such as an individual's school or workplace), community (the norms and standards of the community) and public policy (regulations and laws) levels (Mehtälä, Sääkslahti, Inkinen, & Poskiparta, 2014). Schools generally are an ideal social and cultural environment for health promotion initiatives since they are organisations where children spend large amounts of time; thus, schools hold significant power to influence behaviour and affect the health and wellbeing of students (Kriemler et al., 2011; Naylor, Macdonald, Reed, & McKay, 2006). Further, the current interest in nature-based play and learning in schools presents opportunities for further enhancing uptake and effective implementation of these approaches.

Although there appears to be a movement towards nature-based play and learning in primary schools, little is known about the views of school staff about the barriers and benefits to nature-based play and learning practice in schools. School staff are ideally placed to provide unique insight into the practice of nature-based play and learning within the school setting. Further, understanding school staffs' views of the benefits and barriers to implementing nature-based play and learning within the school environment is critical as school staff can play an influencing role in its adoption. Previous research indicates that school staff perceive nature-based play and learning to improve social skills (Ernst & Tornabene, 2012; Maller & Townsend, 2006; Marchant et al., 2019), student awareness and connection to the environment, physical health and development, and learning and cognitive development (Ernst & Tornabene, 2012; Maller & Townsend, 2006). Other benefits reported by school staff include community connectedness and life skills (Maller & Townsend, 2006), and student engagement, improved behaviour, concentration and teacher job satisfaction (Marchant et al., 2019). While these findings are encouraging, they are based on a small number of studies, including one study conducted with pre-service early childhood educators (Ernst & Tornabene, 2012), which may limit the relevance of these findings to the primary school environment.

Despite the numerous benefits of nature-based play and learning reported by school staff, other research has identified several barriers that hinder the implementation of nature-based play and learning within the school setting. These include limited access to nature or a suitable outdoor space (Bruyere, Wesson, & Teel, 2012; Dymont, 2005; Edwards-Jones, Waite, & Passy, 2018; Ernst, 2007, 2009, 2014; Ernst & Tornabene, 2012; Marchant et al., 2019), limited time (Bruyere et al., 2012; Cutter-Mackenzie & Smith, 2003; Edwards-Jones et al., 2018; Ernst, 2007, 2009, 2014; Marchant et al., 2019), focus on standardised testing (Edwards-Jones et al., 2018; Ernst, 2007, 2009), lack of funding for field trips and transportation (Bruyere et al., 2012; Marchant et al., 2019), general lack of funding (Edwards-Jones et al., 2018; Ernst, 2007, 2009; Marchant et al., 2019), lack of educator knowledge and confidence (Cutter-Mackenzie & Smith, 2003; Dymont, 2005; Edwards-Jones et al., 2018; Marchant et al., 2019), lack of parent (Ernst & Tornabene, 2012) or principal/ leadership support (Cutter-Mackenzie & Smith, 2003; Dymont, 2005; Edwards-Jones et al., 2018), weather (Dymont, 2005; Edwards-Jones et al., 2018; Ernst, 2014), limited staff numbers (Marchant et al., 2019), limited resources (Cutter-Mackenzie & Smith, 2003; Marchant et al., 2019), constant change (Cutter-Mackenzie & Smith, 2003) and safety concerns (Ernst, 2014; Ernst & Tornabene, 2012; Marchant et al., 2019). Much of this previous research on school staff perceptions of benefits and barriers to nature-based play and learning was conducted in a single country, the United States (Bruyere et al., 2012; Ernst, 2007, 2009, 2014; Ernst & Tornabene, 2012), and originates mainly from one research group (Ernst, 2007, 2009, 2014; Ernst & Tornabene, 2012). The experiences of school staff are likely to differ across cultural and geographic settings; thus, there is a need to understand perceptions of benefits and barriers to nature-based play and learning in a variety of geographic and cultural contexts. Also, research to date has been conducted with various participant groups adjacent to primary school staff, including pre-service early childhood teachers (Ernst & Tornabene, 2012), early childhood educators (Ernst, 2014), after-school care instructors (Bruyere et al., 2012) and

kindergarten to year 12 teachers (Ernst, 2007). It is not known whether these groups' views are applicable or relevant to the primary school context specific data from primary school staff is essential to address barriers and enable staff to engage more with nature-based play and learning. To the best of our knowledge, few studies have investigated the perceptions of benefits and barriers to nature-based play and learning held by primary school staff specifically, and no research has done so within the Australian context. Therefore, the objective of this research was to investigate the views of Australian primary school staff on the benefits and barriers to nature-based play and learning.

Methods

This research was conducted and reported in accordance with best practice recommendations (Kelley, Clark, Brown, & Sitzia, 2003) and the STROBE guidelines (Von Elm et al., 2007). The cross-sectional survey method was chosen for its ability to sample participants at one point in time and describe the characteristics of the population of interest using minimal time and resources (Shaughnessy, 2011). The survey was anonymous, although the participants' roles and school names were collected. Participant consent was obtained via a consent statement at the beginning of the survey which was hosted on SurveyMonkey® (SurveyMonkey Inc, 2020). This project was approved by the University of South Australia Human Research Ethics Committee (Application ID: 201091) and the Department of Education (Reference No: 2020-0015).

Participants

All South Australian public primary schools were eligible for inclusion; however, to avoid over-representation from individual schools and to minimise the duplication of data, just one individual per school was invited to complete the survey on behalf of their school, representing their school. The survey was sent to the schools' generic email address, and the school was asked to determine who would be the most appropriate person to participate on behalf of the school. Nature Play SA (NPSA), the South Australian branch of Nature Play Australia, which promotes nature play and outdoor learning to schools and families (Nature Play SA, 2021) and an industry partner for this research, had previous experience in surveying the target population and had existing relationships with South Australian public primary schools. Therefore, the NPSA database of all South Australian public primary schools ($n = 427$) was used for recruitment. NPSA also assisted in the promotion of the survey through their newsletter. As a means of promoting participation, an incentive (a prize draw to win a class incursion from NPSA) was also included in the recruitment materials.

Survey design and development

A customised survey was developed for this study, the development of which was underpinned by a range of strategies. NPSA had developed and administered a survey in 2018 to gather information from their members about the play spaces available in their schoolyards, the use of these spaces, the benefits and barriers to nature play and their use of NPSA services and resources. Given that such a survey was already in existence and had been successfully used with the target population, this study built on and strengthened this existing survey instrument.

Additional questions regarding school and natural outdoor space characteristics and the importance of the benefits of nature-based play and learning were added. To ensure rigour in the development process, as recommended (Hassan, Schattner, & Mazza, 2006; Shaughnessy et al., 2011), the modified survey instrument was then pilot tested with eight NPSA staff members, including four qualified teachers. Given that the staff from NPSA were involved in the development of the original survey and re-engaged in the modification process, this ensured repeatability in the survey re-design. Furthermore, as a means of providing methodological oversight for the survey re-design, the research team members with extensive experience in survey research (SK, KP and KB) also

provided regular input. Thus, bringing together content expertise (NPSA) and methodological expertise (the research team) ensured the re-designed survey instrument adequately covered all the relevant components of nature-based play and learning in South Australian public primary schools (face validity). The feedback from, and testing with, the members of NPSA and the research team resulted in the final survey instrument, which included 31 questions, divided into five sections. A copy of the full survey instrument is provided in the supplementary materials.

This manuscript focuses on school staff perspectives on the barriers and benefits of nature-based play and learning within the primary school setting, and thus will include data gathered in sections one, two and four of the survey. *Section one* contained four questions regarding participant characteristics (e.g. age bracket, gender and role). *Section two* contained three free-response items concerning school characteristics and the school's Index of Economic Disadvantage (IED). The IED is an index used by the Department for Education, the most disadvantaged schools have an index of 1 and the least disadvantaged have an index of 7 (The Government of South Australia, 2012). *Section four* consisted of three questions regarding staff members' views on the barriers to (e.g. lack of time, lack of funding) and benefits of nature-based play and learning for staff (e.g. improved staff well-being and development of personal practice) and students (e.g. cognitive development and connection to nature), followed by two seven-point Likert scales to rank the importance of the benefits selected for the students as well as for the staff and organisation (1 = extremely unimportant, 7 = extremely important).

Data collection

All South Australian public primary schools were contacted via an email from the NPSA database. The email provided information about the research, a copy of the participant information sheet and a link to the survey. The recruitment material highlighted that the researchers were seeking a variety of views on nature-based play and learning, including from those who have limited experience. Follow-up emails were sent one and two months after the initial contact. Participants completed the survey between August and December 2019.

Data analysis

Statistical analysis was conducted using SPSS Statistics V26 (IBM Corp., 2019), and the level of significance was set at $\alpha < 0.05$. All quantitative data were descriptively analysed using frequency distributions and percentages, and Chi-square tests were used to determine associations between school or participant characteristics and the benefits or barriers reported. The benefits and barriers were individually analysed against school location (rural or metropolitan), participant years of experience in a school environment, the school Index of Educational Disadvantage (1 = most disadvantaged, 7 = least disadvantaged) and student enrolment numbers. Categorical data with more than two categories were collapsed into two categories (high and low or small and large) to minimise the number of Chi-square tests that violate the assumption that 20% of the expected counts will be greater than 5 (Field, 2013). Participant years of experience in the school environment were categorised as low (0 to 10 years) or high (≥ 11 years), Index of Educational Disadvantage was categorised as most disadvantaged (index 1 to 4) or least disadvantaged (index 5 to 7), and school size (based on student enrolments) was split at the mean and categorised as small or large. Where assumptions of the Chi-square test were violated, Fisher's Exact Test (2-sided) was used (Gaddis & Gaddis, 1990). Qualitative data from free-text responses were analysed by one researcher (NM) using thematic analysis (Braun & Clarke, 2013) and verified by a second researcher (SK). This process included generating codes by identifying possible patterns in the data, then allocating similar codes into groups to create potential themes. These potential themes were then checked against the original data, if they were deemed to be representative, they were assigned a theme name and definition (Braun & Clarke, 2013).

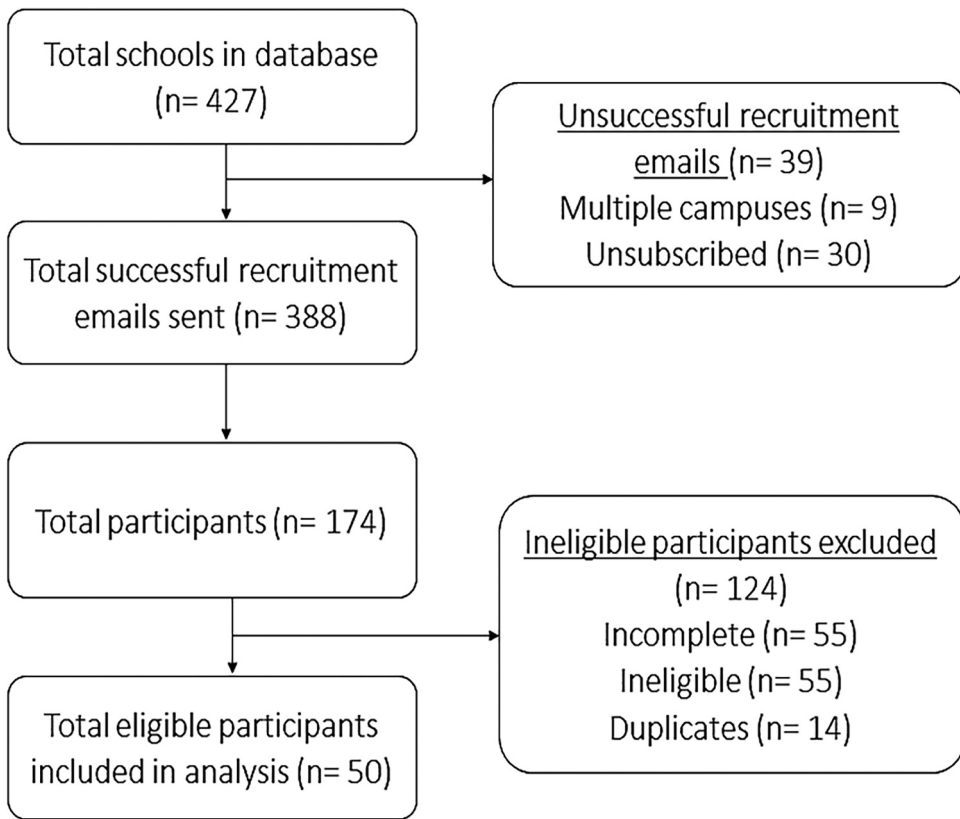


Figure 1. Participant recruitment procedure.

Results

Of the total 427 schools on the database, the recruitment email was successfully delivered to 388 South Australian public primary schools. Of the 39 unsuccessful emails, nine were schools with one email address shared across multiple campuses; thus, there were multiple sites with the same address listed. The email system (Mail Chimp) sent the email to each address only once. The remaining 30 schools had unsubscribed from the NPSA mailing list before the survey (but had remained on the database).

A total of 174 participants responded to the survey. However, some of these participants were excluded. Participants were excluded if they were from a site that was not a public primary school (i.e., an ineligible site), had not provided essential data (i.e., participant and school characteristics), or if someone from their school had already participated. There were 55 participants from ineligible, including pre-schools, private primary schools or after school care centres. A further 55 participants were excluded for missing data. Finally, where more than one participant from a single school had participated, the participant with the most comprehensive or the earliest response was included. Following these exclusions (illustrated in Figure 1), the number of eligible participants included in the analysis was 50, and the response rate was 13%.

Participant and school characteristics

The demographic characteristics of participants are displayed in Table 1. The majority (92%) of participants were female, most were aged 45 to 54 years (32%) or 35 to 44 years (22%) and were mainly educators (68%). Twelve participants provided free text responses. These responses were

Table 1. The Demographic Characteristics of South Australian Public School Staff (n = 50) and Their Schools.

	Number of Participants n (%)
Age group	
18–24	2 (4)
25–34	10 (20)
35–44	11 (22)
45–54	16 (32)
55+	11 (22)
Gender	
Female	46 (92)
Male	4 (8)
Role	
Educator	34 (68)
Principal	4 (8)
School Services Officer	2 (4)
Other	10 (20)
Experience	
0–5 years	9 (18)
6–10 years	9 (18)
11–15 years	6 (12)
16–20 years	9 (18)
20+ years	17 (34)
Area	
Rural	22 (44)
Metropolitan	28 (56)
Index of Educational Disadvantage	
Unsure	2 (4)
1	2 (4)
2	5 (10)
3	9 (18)
4	5 (10)
5	6 (12)
6	12 (24)
7	9 (18)

from deputy principals (n = 4), a parent volunteer (n = 1), and other school staff in roles such as facilities manager. Each participant was from a different school, thus representing 50 unique South Australian public primary schools, with just over half (56%) of participating schools in metropolitan Adelaide. Just over half (54%) of participant schools were considered less socio-economically disadvantaged (IED = 5–7).

The reported benefits of nature-based play and learning in schools

All 50 participants reported benefits of nature-based play and learning to students (see Table 2). The most commonly reported benefits were mental health (reported by 98% of participants), cognitive development (96%), connection to nature (96%), spending time outdoors/ in nature (96%) and risk-taking (96%). A total of four free-text responses were received and grouped into two categories, including *learning benefits* such as ‘STEM activities’ and ‘learning to manage focus and self outdoors’ (n = 4), and *cognitive benefits* such as ‘refreshing environment’ and ‘freedom’ (n = 3).

The most commonly reported benefits to staff and the organisation were reported to be engaging and developing relationships with students (reported by 90% of participants), development of personal practice (80%), developing a sense of community (74%) and improved staff wellbeing (74%). A total of five free-text responses were received and grouped into three categories.

Table 2. The Benefits of Nature-Based Play and Learning Reported by School Staff (n = 50) from 50 Schools and the Percentage of Participants (n = 47) Who Rated the Benefit as Important.

Benefits	n* (%)	Participants who Rated the Benefit as Important (Rating 6 or 7 out of 7) (%)
Mental health	49 (98)	88
Cognitive development	48 (96)	77
Connection to nature	48 (96)	83
Spending time outdoors/ in nature	48 (96)	83
Risk-taking	48 (96)	81
Use of imagination and creativity	47 (94)	89
Education about the environment/ sustainability	46 (92)	78
Physical activity	46 (92)	76
Student wellbeing	45 (90)	87
Social development	45 (90)	82
Emotional development	44 (88)	84
Accessible for many students	44 (88)	84
Keep students engaged in learning	43 (86)	84
Literacy and numeracy skills	39 (78)	79
Benefits for staff and organisation		
Engaging and developing relationships with students	45 (90)	71
Development of personal practice	40 (80)	65
Developing a sense of community	37 (74)	78
Improved staff wellbeing	37 (74)	73

*Participants were able to select multiple benefits

Connection to nature such as 'sustainable behaviour' and 'connection to land' (n = 3) was reported as a benefit, as well as *inclusive space* such as 'space for all to enjoy' (n = 1) and 'satisfaction in seeing benefits for students' (n = 1).

The importance of the perceived benefits for students, staff and organisation were reported by 47 participants. As shown in Table 3, all benefits were rated as 6 or 7 (7 = 'extremely important') by at least 71% of participants. Participant ratings for the value their school places on outdoor learning were provided by 47 participants. The median rating was 6 (IQR = 3), indicating it was considered very important.

The reported barriers to nature-based play and learning in primary schools

Barriers to nature-based play and learning were reported by all 50 participants (see Table 3). The most commonly reported barriers to nature-based play and learning included 'teacher knowledge and/ or confidence' (reported by 68% of participants), 'crowded curriculum' (64%) and 'lack of understanding or support from others' (38%). A total of eight free-text responses were received and grouped into two categories, including *organisational* barriers such as 'lack of materials' and 'lack of pedagogy to use the nature to the fullest' (n = 4), and *environmental* barriers such as 'lack of nearby toilets,' 'lack of access for the disabled' and 'snakes' (n = 4).

Table 3. The barriers to nature-based play and learning reported by school staff (n = 50) from 50 South Australian public primary schools

Associations between benefits and barriers to nature-based play and learning and school characteristics

Statistical analysis was conducted to determine whether individual benefits or barriers were associated with school location (rural or metropolitan), a participant's experience working in a school environment (low 0–10 years or high 11+ years), the school's IED, and school size (small <318

Table 3. The Barriers to Nature-Based Play and Learning Reported by School Staff (n = 50) from 50 Schools.

Barriers	n* (%)
Teacher knowledge and/ or confidence	34 (68)
Crowded curriculum	32 (64)
Lack of understanding or support from others	19 (38)
Lack of time	17 (34)
Weather	15 (30)
Lack of funding	15 (30)
Staff safety concerns	14 (28)
Lack of suitable space/ venue	9 (18)
Limited supervision	8 (16)
Children's behaviour	8 (16)
Parent safety concerns	7 (14)
Class size	4 (8)
School policy	2 (4)
Children's ages	1 (2)
Lack of student interest	0 (0)

*Participants were able to select multiple barriers

students or large >318). The barrier 'lack of student interest' was excluded from this analysis as it was not selected by any participants. Participants from metropolitan schools were more likely to select time as a barrier ($\chi^2(1) = 4.38, p = 0.036$) compared to those in rural and remote schools. Participants with less experience working in a school environment (0–10 years) were more likely to select 'children's behaviour' as a barrier ($p = 0.019$) and less likely to select 'accessible for many students' as a benefit ($p = 0.001$) compared to those with more experience. No other statistically significant associations were found between benefits or barriers and school or participant characteristics.

Discussion

To date, few studies have investigated primary school staff perceptions of the benefits and barriers to nature-based play and learning in primary schools, and no research has done so in the Australian context. By addressing these knowledge gaps, this study has identified that Australian primary school staff perceive several benefits of nature-based play and learning spanning multiple domains (cognitive, mental health and physical). While this is a positive finding, school staff also report that barriers exist in implementing nature-based play and learning at the frontline of education.

In this study, 74% of participants selected all possible benefit of nature-based play and learning options listed in the survey. This finding is supported by systematic reviews that have identified a broad range of benefits for children's health, wellbeing and development (Becker et al., 2017; Dankiw et al., 2020; Miller et al., 2021; Mygind et al., 2019). However, a novel finding was school staff reporting mental health and risk taking as a benefit. Emerging research suggests that nature can positively influence children's mental health (Chawla, Keena, Pevec, & Stanley, 2014; Kuo, Barnes, & Jordan, 2019; McCormick, 2017; Miller et al., 2021; Mygind et al., 2019), and a systematic review of the impact of green space on children's mental health found that it can aid attention restoration, stress reduction, improve symptoms of ADHD and enhance performance in standardised tests (McCormick, 2017). Another, more recent, systematic review found that some nature-based play and learning programs may benefit child and adolescent self-esteem, self-efficacy, resilience and academic and cognitive performance (Mygind et al., 2019). While these are encouraging findings and may complement similar findings in adults (Kaplan, 1995; Park, Tsunetsugu, Kasetani, Kagawa, & Miyazaki, 2010; Ulrich, 1984), given the methodological concerns of the evidence base to date, further higher quality research is required (Becker et al., 2017; McCormick, 2017). Research also suggests that risk taking is a benefit of nature-based play and learning. One study of early childhood educators' attitudes to risky outdoor play showed that most educators thought risky outdoor play activities were important (McFarland & Laird, 2018). The broader literature indicates that risky play may be beneficial for

children's development (Little & Wyver, 2008; Sandseter, 2009), including a systematic review that indicated risky outdoor play can have positive impacts on children's physical activity and social health (Brussoni et al., 2015).

Cognitive development, connection to nature, spending time outdoors or in nature and risk taking were among the most commonly identified benefits of engaging in nature-based play and learning in this study. These findings are supported by previous research, including a study that found Melbourne primary school principals and teachers perceived learning and connection to nature to be key benefits of nature-based play and learning (Maller & Townsend, 2006). Further, a study with pre-service early childhood educators in the US found that fostering an appreciation for nature and cognitive development were perceived as benefits of nature-based play and learning (Ernst & Tornabene, 2012). On the other end of the spectrum, the benefit least selected by participants (78%) was 'literacy and numeracy skills.' This may be due to the perception identified in previous research that nature-based play and learning is only suitable for science and physical education classes (Dyment, 2005; Ernst, 2007, 2009) and 'real work' only takes place inside the classroom (Maynard, Waters, & Clement, 2013). This is an important issue to address (MacQuarrie, 2018), as perceptions, particularly those of school staff, can influence behaviour and act as barriers to the uptake of nature-based play and learning in the school context.

Despite the overwhelming view that nature-based play and learning has positive impacts for children, barriers to its uptake exist. The mitigation of these barriers is essential to the effective implementation and practice of nature-based play and learning in schools. 'Teacher knowledge and/or confidence' was the most prevalent barrier in this study. Previous research suggests that teachers' lack of knowledge and/or confidence may be attributed to a lack of training (Cutter-Mackenzie & Smith, 2003; Dyment, 2005; Edwards-Jones et al., 2018; Marchant et al., 2019). This could be addressed by targeted upskilling of teachers in implementing nature-based play and learning within the school setting (Ernst & Tornabene, 2012; Marchant et al., 2019). Marchant et al. (Marchant et al., 2019) found that school staff who had previously received training in established nature-based learning programs such as forest schools voiced greater confidence in engaging students in outdoor learning. Similarly, Bruyere et al. (2012) demonstrated that identifying barriers upfront and implementing tailored strategies such as role modelling of activities and a supported curriculum planning session can improve confidence, ability and motivation to practice environmental education amongst staff at an after school program.

The second most prevalent barrier was 'crowded curriculum,' this is consistent with previous studies, albeit using alternate terms, such as 'limited time' (Bruyere et al., 2012; Edwards-Jones et al., 2018; Ernst, 2007, 2009, 2014; Marchant et al., 2019) and 'a focus on standardised testing' (Edwards-Jones et al., 2018; Ernst, 2007, 2009). School staff may perceive nature-based play and learning as suitable for some curriculum areas and not others and may lack sufficient knowledge and resources to integrate nature-based play and learning into the wider curriculum (Ernst, 2007). Training to improve the knowledge, skills, and confidence of school staff in integrating nature-based play and learning as part of routine school activities, rather than an add-on, may address this barrier. Targeted training to address these major barriers could be an important intervention to allow schools to take advantage of their unique potential for health promotion (Kriemler et al., 2011; Naylor et al., 2006). This barrier also suggests that broader cultural change within the education system is required to relieve the pressure on school staff to achieve numerous and diverse curriculum outcomes.

This research did not find any associations between the selected barriers to nature-based play and learning and a school's level of economic disadvantage. This is a promising finding as it suggests that there may be equal access to nature-based play and learning for all children. Further research is required to substantiate these findings, as the evidence base on this topic is limited. An interesting, novel association was that participants with less experience working in a school environment were more likely to select 'children's behaviour' as a barrier to implementing nature-based play and learning into the school day. Novice school staff may not be sufficiently equipped to deal with children's challenging behaviours. Studies of pre-service and early career educators report they feel

underprepared for or are concerned about classroom management (Giallo & Little, 2003; Maskan, 2007; Mastrilli & Sardo-Brown, 2002; Sjöblom, Eklund, & Fagerlund, 2021). Further, studies suggest pre-service teachers also lack confidence in their ability to teach outdoors (Barrable & Lakin, 2020). Perhaps teachers feel more 'in control' of children's behaviour in a structured classroom setting or perceive that they will be less 'in control' when their class is outdoors. Training by, and mentorship with, experienced school staff may help to equip novice school staff to better deal with children's behaviour when engaged with nature-based play and learning (Geeraerts, Tynjälä, & Heikkinen, 2018).

As many of the barriers to nature-based play and learning relate to teacher knowledge and/or confidence in how best to integrate nature-based play and learning in the curriculum, this calls for training, education, and support for school staff in the planning and delivery of nature-based play and learning (Ernst, 2007; Malone & Tranter, 2003). This could be achieved through targeted training for pre-service teachers and professional development with current school staff (Barrable & Lakin, 2020; Bruyere et al., 2012; Ernst & Tornabene, 2012; Marchant et al., 2019). Training for school staff could be supported by peer groups through communities of practice. Training could also be supported at higher levels of influence, such as school leadership and principals, as research suggests that school leaders play an important role in allowing staff the time to participate in professional development activities (Edwards-Jones et al., 2018). While it is important to address barriers at the frontline of teaching, other barriers (such as a crowded curriculum) require a system-level approach. Multifaceted intervention strategies, such as advocacy, mass media campaigns, interactive educational sessions, may be required to embrace nature-based play and learning, and reduce the pressure on school staff and the focus on traditional modes of enabling students to achieve academically (Dyment, 2005). As there is currently no standardised way of implementing nature-based play and learning in schools, future research could focus on best practice for its implementation and sustainability. This will address critical barriers to its uptake, ensure standardisation and provide opportunities for comparative evaluation and research.

Limitations

There are two major limitations of this research; the potential for response bias and the low response rate. Firstly, there may have been a response bias as schools that are more engaged with nature-based play and learning may have been more likely to respond and may also have been more likely to report benefits (Maller & Townsend, 2006). Respondents were also primarily female; however, this reflects the proportions of teachers in Australia (81.9% female) (Australian Bureau of Statistics, 2020). Secondly, this study is limited by the low response rate. The low response rate meant that the sample size was small, which limits the generalisability of the results. While response rates for online survey research are typically around 30% (Nulty, 2008; Shih & Fan, 2009), similar studies on this topic have received comparable response rates (18.2%) (Maller & Townsend, 2006) and other recent online surveys of teachers, which have used similar methodologies, also had similar response rates of 16% (Almond, Swain, Hanson, Gibney, & Shelnett, 2020), 14% (Shurr, Bouck, & McCollow, 2021) and 8.27% (Feille & Nettles, 2019). The low response rate in the current study may have been partly due to the delivery method; the survey was sent to a generic school email address, not to a specific person, and perhaps this resulted in the survey not reaching a suitable staff member. This lack of targeted approach may have also been the cause of some of the duplicate responses received from multiple staff members from the same school. Another possible explanation for the response rate was the timing; the survey coincided with terms 3 and 4, which are commonly the busiest periods in the Australian school year (Maller & Townsend, 2006). A number of strategies were used to minimise the potential response bias and maximise response rates. The survey was sent to all South Australian Public Primary schools, it remained open for several months, and the recruitment material made it clear that the researchers were seeking a variety of views on nature-based play and learning, including from those who do not use it. An incentive to participate was also included, although it is acknowledged that research indicates incentives have little effect on response rates (Sauermaann & Roach, 2013).

Conclusions

This research was the first to investigate the perceptions of South Australian primary school staff on the barriers and benefits of nature-based play and learning. The results indicate that South Australian public primary school staff believe there are a wide range of potential benefits for children's health and wellbeing that may result from nature-based play and learning. However, they are also confronted by barriers to its implementation. The most common of these include limitations in teacher knowledge of and confidence in nature-based play and learning, and limitations on time to fit these activities into an already crowded curriculum. Mitigating these barriers should be the focus of future research and practice initiatives to ensure children are able to access nature-based play and learning opportunities at school.

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References

- Almond, C., Swain, M., Hanson, D., Gibney, V. H., & Shelnut, K. (2020). Evaluating the Utilization of School Gardens in Florida Through a Teacher Survey. *Journal of Nutrition Education and Behavior*, 52(7), S39.
- Australian Bureau of Statistics. (2020). Data on students, staff, schools, rates and ratios for government and non-government schools, for all Australian states and territories. Accessed 02 November 2021. Retrieved from <https://www.abs.gov.au/statistics/people/education/schools/2019>
- Barrable, A., & Lakin, L. (2020). Nature relatedness in student teachers, perceived competence and willingness to teach outdoors: An empirical study. *Journal of Adventure Education and Outdoor Learning*, 20(3), 189–201.
- Becker, C., Lauterbach, G., Spengler, S., Dettweiler, U., & Mess, F. (2017). Effects of regular classes in outdoor education settings: A systematic review on students' learning, social and health dimensions. *International Journal of Environmental Research and Public Health*, 14(5), 485.
- Bentsen, P., Jensen, F., Mygind, E., & Randrup, T. (2010). The extent and dissemination of udeskole in Danish schools. *Urban Forestry and Urban Greening*, 9(3), 235–243.
- Braun, V., & Clarke, V. (2013). *Successful qualitative research: a practical guide for beginners*. London: Sage.
- Brussoni, M., Gibbons, R., Gray, C., Ishikawa, T., Sandseter, E. B. H., Bienenstock, A., ... Janssen, I. (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.
- Bruyere, B. L., Wesson, M., & Teel, T. (2012). Incorporating environmental education into an urban after-school program in New York City. *International Journal of Environmental and Science Education*, 7(2), 327–341.
- Chawla, L., Keena, K., Pevec, I., & Stanley, E. (2014). Green schoolyards as havens from stress and resources for resilience in childhood and adolescence. *Health & Place*, 28, 1–13.
- Chawla, L. (2015). Benefits of nature contact for children. *Journal of Planning Literature*, 30(4), 433–452.
- Coe, D. P., Flynn, J. I., Wolff, D. L., Scott, S. N., & Durham, S. (2014). Children's physical activity levels and utilization of a traditional versus natural playground. *Children Youth and Environments*, 24(3), 1–15.

- Cutter-Mackenzie, A., & Smith, R. (2003). Ecological literacy: The 'missing paradigm' in environmental education (part one). *Environmental Education Research*, 9(4), 497–524.
- Dankiw, K. A., Tsiros, M. D., Baldock, K. L., & Kumar, S. (2020). The impacts of unstructured nature play on health in early childhood development: A systematic review. *PLoS One*, 15(2), e0229006.
- Dymont, J. E. (2005). Green school grounds as sites for outdoor learning: Barriers and opportunities. *International Research in Geographical & Environmental Education*, 14(1), 28–45.
- Edwards-Jones, A., Waite, S., & Passy, R. (2018). Falling into LINE: School strategies for overcoming challenges associated with learning in natural environments (LINE). *Education*, 46(1), 49–63.
- Ernst, J. (2007). Factors associated with K-12 teachers' use of environment-based education. *The Journal of Environmental Education*, 38(3), 15–32.
- Ernst, J. (2009). Influences on US middle school teachers' use of environment-based education. *Environmental Education Research*, 15(1), 71–92.
- Ernst, J., & Tornabene, L. (2012). Preservice early childhood educators' perceptions of outdoor settings as learning environments. *Environmental Education Research*, 18(5), 643–664.
- Ernst, J. (2014). Early childhood educators' use of natural outdoor settings as learning environments: An exploratory study of beliefs, practices, and barriers. *Environmental Education Research*, 20(6), 735–752.
- Feille, K., & Nettles, J. (2019). Permission as support: Teacher perceptions of schoolyard pedagogy. *Electronic Journal of Science Education*, 23(3), 1–31.
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. sage.
- Gaddis, G. M., & Gaddis, M. L. (1990). Introduction to biostatistics: Part 5, statistical inference techniques for hypothesis testing with nonparametric data. *Annals of Emergency Medicine*, 19(9), 1054–1059.
- Geeraerts, K., Tynjälä, P., & Heikkinen, H. L. (2018). Inter-generational learning of teachers: What and how do teachers learn from older and younger colleagues? *European Journal of Teacher Education*, 41(4), 479–495.
- Giallo, R., & Little, E. (2003). Classroom behaviour problems: The relationship between preparedness, classroom experiences, and self-efficacy in graduate and student teachers. *Australian Journal of Educational & Developmental Psychology*, 3(1), 21–34.
- The Government of South Australia. (2012). Index of educational disadvantage analysis. Accessed 20 October 2021. Retrieved from https://www.education.sa.gov.au/sites/default/files/educational_disadvantage_index_explanation.pdf?acsf_files_redirect
- Hassan, Z. A., Schattner, P., & Mazza, D. (2006). Doing a pilot study: Why is it essential? *Malaysian Family Physician: the Official Journal of the Academy of Family Physicians of Malaysia*, 1(2–3), 70.
- IBM Corp. (2019). *IBM SPSS Statistics for Windows, Version 26.0*. Armonk, NY: IBM Corp.
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, 15(3), 169–182.
- Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, 15(3), 261–266.
- Kriemler, S., Meyer, U., Martin, E., van Sluijs, E. M., Andersen, L. B., & Martin, B. W. (2011). Effect of school-based interventions on physical activity and fitness in children and adolescents: A review of reviews and systematic update. *British Journal of Sports Medicine*, 45(11), 923–930.
- Kuo, M., Barnes, M., & Jordan, C. (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10, 305.
- Little, H., & Wyver, S. (2008). Outdoor play: Does avoiding the risks reduce the benefits? *Australasian Journal of Early Childhood*, 33(2), 33–40.
- MacQuarrie, S. (2018). Everyday teaching and outdoor learning: Developing an integrated approach to support school-based provision. *Education*, 46(3), 345–361.
- Mainella, F. P., Agate, J. R., & Clark, B. S. (2011). Outdoor-based play and reconnection to nature: A neglected pathway to positive youth development. *New Directions for Student Leadership*, 2011(130), 89–104.
- Maller, C., & Townsend, M. (2006). Children's mental health and wellbeing and hands-on contact with nature. *International Journal of Learning*, 12(4), 359–372.
- Maller, C., Townsend, M., Pryor, A., Brown, P., & St Leger, L. (2006). Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International*, 21(1), 45–54.
- Malone, K., & Tranter, P. J. (2003). School grounds as sites for learning: Making the most of environmental opportunities. *Environmental Education Research*, 9(3), 283–303.
- Marchant, E., Todd, C., Cooksey, R., Dredge, S., Jones, H., Reynolds, D., ... Brophy, S. (2019). Curriculum-based outdoor learning for children aged 9-11: A qualitative analysis of pupils' and teachers' views. *PLoS One*, 14(5), e0212242.
- Maskan, A. K. (2007). Preservice science and math teachers' difficulties in disruptive behavior and class management. *International Journal of Educational Reform*, 16(4), 336–349.
- Mastrilli, T., & Sardo-Brown, D. (2002). Novice teachers' cases: A vehicle for reflective practice. *Education*, 123(1), 56–62.
- Maynard, T., Waters, J., & Clement, J. (2013). Moving outdoors: Further explorations of 'child-initiated' learning in the outdoor environment. *Education*, 41(3), 282–299.

- McCormick, R. (2017). Does access to green space impact the mental well-being of children: A systematic review. *Journal of Pediatric Nursing: Nursing Care of Children and Families*, 37, 3–7.
- McFarland, L., & Laird, S. G. (2018). Parents' and early childhood educators' attitudes and practices in relation to children's outdoor risky play. *Early Childhood Education Journal*, 46(2), 159–168.
- Mehtälä, M. A. K., Sääkslahti, A. K., Inkinen, M. E., & Poskiparta, M. E. H. (2014). A socio-ecological approach to physical activity interventions in childcare: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 11(1), 1–12.
- Miller, N. C., Kumar, S., Pearce, K. L., & Baldock, K. L. (2021). The outcomes of nature-based learning for primary school aged children: A systematic review of quantitative research. *Environmental Education Research*, 27(8), 1115–1140.
- Momentive Inc. (2020). SurveyMonkey Online Survey Software, San Mateo, California, USA.
- Mygind, L., Kjeldsted, E., Hartmeyer, R., Mygind, E., Bølling, M., & Bentsen, P. (2019). Mental, physical and social health benefits of immersive nature-experience for children and adolescents: A systematic review and quality assessment of the evidence. *Health & Place*, 58, 102136.
- Nature Play, S. A. (2021). About. Accessed 06 August 2021. Retrieved from <https://natureplaysa.org.au/about/>
- Naylor, P.-J., Macdonald, H. M., Reed, K. E., & McKay, H. A. (2006). Action Schools! BC: A socioecological approach to modifying chronic disease risk factors in elementary school children. *Preventing Chronic Disease*, 3(2), 1–8.
- Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: What can be done? *Assessment & Evaluation in Higher Education*, 33(3), 301–314.
- Park, B. J., Tsunetsugu, Y., Kasetani, T., Kagawa, T., & Miyazaki, Y. (2010). The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): Evidence from field experiments in 24 forests across Japan. *Environmental Health and Preventive Medicine*, 15(1), 18–26.
- Sallis, J. F., & Owen, N. (2015). Ecological Models of Health Behaviour. In Glanz, K., Rimer, B. K., Viswanath, K (eds). *Health behavior: Theory, Research, and Practice*. San Francisco, CA: John Wiley & Sons.
- Sandseter, E. B. H. (2009). Characteristics of risky play. *Journal of Adventure Education & Outdoor Learning*, 9(1), 3–21.
- Sauermann, H., & Roach, M. (2013). Increasing web survey response rates in innovation research: An experimental study of static and dynamic contact design features. *Research Policy*, 42(1), 273–286.
- Shaughnessy, J., Zechmeister, E. B., & Zeichmeister, J.S. (2011). *Research Methods in Psychology* (pp. 161–175). New York, NY: McGraw Hill.
- Shih, T.-H., & Fan, X. (2009). Comparing response rates in e-mail and paper surveys: A meta-analysis. *Educational Research Review*, 4(1), 26–40.
- Shurr, J., Bouck, E. C., & McCollow, M. (2021). Examining Teacher and Teacher Educator Perspectives of Teacher Leadership in Extensive Support Needs. *Teacher Education and Special Education*. doi:10.1177/08884064211001455
- Sjöblom, P., Eklund, G., & Fagerlund, P. (2021). Student teachers' views on outdoor education as a teaching method—two cases from Finland and Norway. *Journal of Adventure Education and Outdoor Learning*, 1–15. doi:10.1080/14729679.2021.2011338
- Ulrich, R. (1984). View through a window may influence recovery. *Science*, 224(4647), 224–225.
- Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Annals of Internal Medicine*, 147(8), 573–577.