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Spying on children during a school playground intervention using a novel method for direct observation of activities during outdoor play

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ABSTRACT

Our aims were to examine the efficacy of a new observational instrument 'System for Observing Outdoor Play' for detecting changes in outdoor play and chart the use of recycled and repurposed materials in the school playground during the course of an intervention to increase outdoor play. Children from one Sydney primary school were observed (N = 111; 5–12 years) using an observational instrument developed as part of the Sydney Playground Project. Data on types of activities and frequencies were collected at baseline and seven times during intervention. Use of intervention materials was consistently high and associated with increases in play-related activities (40–77%), while inactive pursuits decreased (52–31%), on average. The observational instrument proved efficacious in tracking changes in play. Modification of the school playground environment by introducing loose parts changed children's play-related behaviour; the variety of activities increased, including construction and creative play. Physical inactivity decreased. Recycled materials can increase children's creative, social and physical play.

KEYWORDS

Recycled items; play; children; observations; physical activity

Introduction

There has been a proliferation of interest in outdoor play and natural environments, but, as Luchs and Fikus (2013) note, methods for researchers to capture the influence of these places on children's development and learning have not kept pace. Most methods focus on individual children or particular activities, but increasingly researchers are interested in comparing different play contexts (e.g. Storli & Hagen, 2010; Zamani, 2016). In this paper, we examine the use of a new method for observing outdoor play through use of a study involving introduction of loose parts onto an elementary school playground.

The idea that the introduction of loose parts in human environments leads to more play and creativity has been around for at least four decades. Nicholson (1972) synthesised the work in his critique of modern environments in which designers and builders have the fun in planning and creating with loose parts, a process which leaves the end user with limited scope for imaginative play. It is not until recently, however, that use of loose parts on children's playgrounds has become a topic for research (e.g. Bundy et al., 2015; Engelen et al., 2013; Hyndman, Benson, & Telford, 2014a). The play setting in the current study is the school playground. It offers the opportunity to

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model environmental-friendly spaces using playgrounds as a setting for creative, dynamic and imaginative development.

One of the most publicised recent examples of loose parts play for children is the play pods project (Armitage, 2010). Specifically, a mixture of loose materials from local businesses and recycled stations was placed in shipping containers and taken to nine schools in Bristol in the UK, each for 12 weeks over a 3-year period between 2006 and 2009. Schools added sports equipment and other materials to the container. Although the design of the evaluation was not rigorous, the findings pointed to the greater popularity of the loose materials compared with the existing fixed equipment. Multiple methods were used to collect data with a heavy dependence on observational data. The authors of that paper acknowledged one of the limitations was the amount of data generated which essentially became unmanageable in some respects.

Two recent studies have been conducted in single schools and found increases in physical activity following the introduction of loose parts on the playground. Physical activity was objectively measured by pedometers and direct observation (Hyndman et al., 2014b) or accelerometers (Bundy et al., 2008). Both projects also included additional measures such as enjoyment of physical activity (Hyndman et al.) and types of play as well as teacher responses relating to the loose parts intervention (Bundy et al, 2009). These studies serve as useful starting points to establish the potential benefits of loose parts but were limited by the number of schools involved (two and one, respectively) and therefore lack of an adequate control conditions for comparison with their intervention.

The Sydney Playground Project (SPP) (Bundy et al., 2011) comprised a cluster randomised controlled trial in 12 primary schools. The intervention involved placing largely recycled loose part materials (e.g. tires, milk crates and cardboard boxes) on primary school playgrounds for the students to use freely during recess. The introduction of loose part materials altered the physical play space and increased opportunities for unstructured, active and creative play. The intervention proved effective in increasing children's physical activity and reducing sedentary behaviour (Engelen et al., 2013). Interventions such as SPP have been recognised as being both low-cost and effective methods for improving the quality of experiences in school playgrounds (Ickes, Erwin & Beighle, 2013).

The effectiveness of including loose parts on the playground has also been demonstrated in preschools. For example, Maxwell, Mitchell and Evans (2008) found that the introduction of loose parts changed children's play behaviours, leading particularly to increases in constructive play. These changes were reversed when the loose parts were removed. This study also found that the area of the playground in which the loose parts were placed had an influence on the type of play observed. Live coding of the type of play and social interactions was conducted by trained undergraduate students. The observers also generated field notes which included children's conversations for the qualitative analysis. It should be noted that not all loose parts in this study were repurposed. Ideally, play can offer maximal and synergistic benefits to physical health when it is active, to creativity when materials are non-directional and to the environment when materials are recyclable.

The focus for the current study emerged during the SPP intervention and data collection periods. The point of difference was that we became interested in the temporal patterns of the use of the intervention materials. During semi-structured interviews and discussions, teachers and staff reported observations of increased creativity during play, as well as changes in children's social interactions and group dynamics. As part of the SPP intervention, we also collected data about individual children's activities at break times during baseline and following the intervention. However, we were interested in delving deeper into the use of the intervention recycled materials introduced to the playgrounds of the children as a group. In a previous study, the importance of contextual information about children's activities to understand physical activity and active play was stressed (Engelen et al., 2015).The contents of active play are, if not poorly understood, poorly measured. We wanted to monitor the nature of children's activities throughout the intervention and therefore were in need of an instrument that could capture the large variation of activities the children were involved in the use of recycled materials, specifically during free, unstructured play.

We saw this as an opportunity to advance observational protocols that would overcome difficulties encountered in many similar studies. Although it is not always openly stated in publications, examination of the literature, including the research discussed above, reveals that researchers have not yet settled on a satisfactory method of collecting observational data to capture the depth of play experiences for children (Lubans et al., 2011). This has led to a tendency to either underutilise opportunities to collect observational data or capture more information than can be managed. Ideally, any observational scheme developed should be compatible with objective measures of children's physical activity, such as accelerometry, pedometry or heart rate monitors (Dollman et al., 2009). The scheme should be adaptable for different contexts and open to modification, such as inclusion of additional play categories, to suit specific research questions. The scheme should be acceptable for live coding to reduce the problems of costs and intrusiveness that can be associated with video recording and later coding of observations.

A direct observation method, 'System for Observing Play and Leisure Activity in Youth' (SOPLAY) (McKenzie, 2006), was used as a starting point to monitor the changes in activities related to the alteration in the physical environment of the school playground. SOPLAY is a well-researched tool for collecting observational data on children's physical activity in groups (Saint-Maurice, Welk, Ihmels, & Krapfl, 2011) and has frequently been the starting point for new instruments to observe outdoor play (e.g. McKenzie, Cohen, Sehgal, Williamson, & Golinelli, 2006). Hyndman et al. (2014b) also used a modified version of the SOPLAY, but the modifications were not extensive. For this paper, the 'System for Observing Outdoor Play' (SOOP) was developed to include a greater range of study-specific activities than SOPLAY, including passive, active, social and play aspects.

There were two main aims of the development of SOOP. The first was to design a reliable cost-effective tool that can be used in research and also by school staff to understand the different types of playground activities children are engaged in and how many children are taking part in these activities. Many coding schemes rely on video-analysis and technology that may not be readily available to school staff or researchers with limited funding. The second was to develop a coding scheme that is useful to a large number of disciplines. The categories selected come from multidisciplinary research rather than reflecting the interests of a single discipline. A wide range of disciplines are interested in outdoor play including physiologists, educators, psychologists and anthropologists. In order to advance understanding, it is important that the various disciplines start to use common measurement tools. This is particularly important for systematic reviews and meta-analyses that increasingly underpin evidence-based practice. We used SOOP to chart the use of recycled and repurposed materials in the school playground during the course of an intervention to increase outdoor play.

Methods

Participants

For the observational measures, participants were children (53 girls and 58 boys, 5–12 years) attending one small primary school in Sydney's Inner-West, Australia. The participants represented diverse socioeconomic backgrounds, 26% from the lowest quartile and 46% highest quartile; 45% had a language background other than English, and 10% of the children were of Indigenous Australian background. This study was approved by the University of Sydney Human Ethics Committee and the participating school management bodies.

Intervention

The playground-based intervention involved introducing primarily recycled loose part materials with no obvious play purpose to the school playground for use during all recess. The goal was that these inexpensive materials would promote cooperative, creative and gross-motor play. Examples of play

materials included car tyres, milk crates and fabric. All items met Australian Standards for playground equipment. The intervention protocol has been published elsewhere (Bundy et al., 2011).

Observations of play (SOOP)

The SOOP was developed to describe the social and creative nature of activities and the number of children involved in the SPP. SOOP is an objective tool used to quantify components of physical activity in 'open' environments such as recreational and leisure settings.

SOOP was based on systematic observational scans of individuals and the activities in which they engaged within a predetermined area. During a scan, observations were recorded manually on a data sheet with a visual map of the school playground. The numbers of children involved in one activity were recorded, and the total number of children in the predetermined area was calculated by adding the total number of children.

SOOP focuses strongly on the types of activities children engage in, including different *types of play* and less on the different types of *sports*, as opposed to observational methods such as SOPLAY. A set of 10 categories were developed by thematic grouping of activities observed on the playground during the pilot phases of the project: Active play; Construction; Creative/imaginative play; Eating, moving-not playing; Inactive (sitting or standing) play; Inactive – not social (alone or no interaction); and Inactive – social, Sports). Creative, imaginative play included play in which materials were used for nontraditional purposes, objects were assigned a character such as a tire becoming a truck or children created stories or new possibilities for rearranged materials.

To ensure that the observers shared a common interpretation of the construct, three observers assessed simultaneous observations which they subsequently compared and discussed in detail until consensus was reached. This was repeated over several sessions, and the consensus by interval was 95%, which is considered high (Stemler, 2004). Following training, the 'real' measurements were commenced. For internal consistency, one of the three observers completed all the observations. Comparisons and consensus were routinely done by all three observers for the two steps of the observation/data collection (observation and categorising) to ensure that no 'observer drift' had taken place (Kazdin, 1977).

Protocol

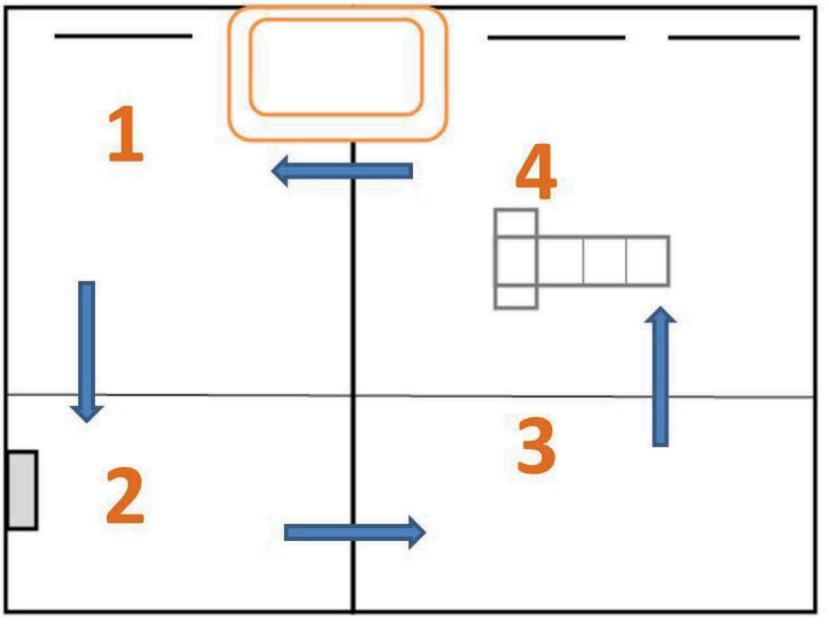
Data were collected in 2011 across three school terms. In total, there were eight observation periods (one baseline and seven weekly during the intervention), on the same day of the week and at a similar time of the day.

Observation area

Direct observations were made in a designated target area in which the equipment was going to be available on the school playground; hence, the same area was observed at baseline and during the intervention. This area was predetermined in consultation with staff at the school. The selected area was one of two playground areas available to the children and they could choose which area to play in. A schematic map of the observation area was created including fixed structures, trees and line markings (Figure 1). The area was divided into quadrants (Figure 2). Observations were noted on the map with additional space for extra information.

Recording

Researchers were unobtrusively positioned behind a first-floor window, providing an aerial view. Observations were made each minute during 20 min and a recorded message on an iPod alerted to a minute passing. Each minute, the observer would scan the target area from top left in an anticlockwise direction. The total number of children and the number of boys and girls in each



Total number of children:

Number of groups:

Activities:

Activity	Activity Level

Ages (approx):

Figure 1. Data collection sheet.

group were recorded. Boys were recorded with a *b* and girls with a *g* in the approximate area represented on the map. We noted what the children were doing/what activities from the predetermined categories they were engaged in and whether SPP equipment was involved. If an observed child reappeared in the scan area, they were not recorded a second time within that minute. The presence of teachers in the target area was also noted. At the end of the 20-min observation period, all observations were transferred into electronic format for further analysis.

A detailed manual of the method can be obtained by contacting Shirley.wyver@mq.edu.au.

Data analysis

Data were regrouped into the predetermined categories and are reported using frequencies for each of the categories.

Figure 2. Photo of scan area as seen by the observer.

T-tests were used to compare the proportions of the various activity categories at baseline and during the intervention using STATA 13 SE. $p < 0.05$ was considered significant.

Results

SOOP proved to be an effective method for unobtrusive collection of observational data and easy to achieve high levels of agreement amongst raters. Results from our intervention study demonstrated sensitivity to changes in play. Compared with baseline observations, some notable changes occurred during the intervention: The total observations of inactive pursuits (eating, inactive – not social and inactive social) decreased from more than half (52%) of the total observations at baseline to less than a third (31%) during the intervention (Table 1). Observed reductions in 'inactive not social' and 'inactive social' play were significant. 'Moving without playing' (often aimless wandering) also decreased significantly. These reductions made way for three new categories, which were not observable at baseline: 'creative play', 'construction' and 'inactive play'. Although the proportion of 'sports' decreased during the intervention, the proportion of observations spent in play- and sport-related activities increased from 40% to 77%. In addition, within these new categories, the loose part recycled items were often to always used (60–100%).

Figure 3 shows the percentage of observations that were spent in the various activity categories at baseline and intervention by gender. Both boys and girls reduced their time in the categories

Table 1. Baseline and intervention frequencies of the various activity categories and results of *z*-test, along with the extent to which the intervention materials were used for the different activities in %.

	Baseline (%)	Intervention (%)	*t*-Score	*p*	CI of difference	Use of intervention material (%)
Active play	30	37	0.08	0.53	(2.6, 3.3)	72
Construction	0	13	4.1	0.00	(0.11, 0.15)	100
Creative play	0	19	5.1	0.00	(0.17, 0.21)	98
Sports	10	6	−1.69	0.04	(−0.096, 0.017)	13
Moving, not playing	36	14	−6.25	0.00	(−0.31, −0.13)	12
Inactive play	0	1	1.07	0.14	(0.005, 0.015)	60
Inactive– social	35	18	−4.4	0.00	(−0.26, −0.08)	19
Inactive – non-social	7	3	−2.31	0.01	(−0.088, 0.008)	23
Eating	11	8	−1.1	0.13	(−0.09, 0.03)	2

$p < 0.05$ was considered significant.
CI: confidence interval.

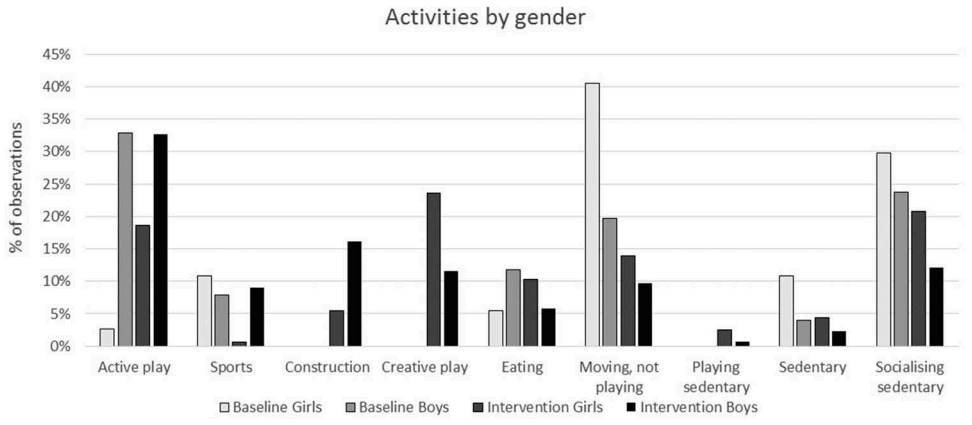


Figure 3. Percentage of observations spent in each of the activity categories at baseline and during intervention by gender.

moving, not playing and sedentary socialising. Although both boys and girls increased construction and creative play at intervention, boys engaged in more construction and girls in more creative play. Girls increased their active play from 3% to 18%, while their engagement in sports decreased from 11% to 1%. Boys remained high in both those categories.

Discussion

This study demonstrated that the new observational method, SOOP, was a promising method for monitoring activities during outdoor play, and it was sensitive to changes in children's outdoor play associated in changes in the environment. We were able to conduct the observations without being intrusive, and therefore, we overcame the problem of potential observer influence on play. In previous research (Bundy et al., 2011), we used the traditional procedure of coding from video recordings but noted limitations of the data collection method. The use of SOOP for data collection was less intrusive than video recording, and the addition of specific types of play such as constructive and creative play in the SOOP allowed for a more comprehensive and dynamic snapshot of the children's activities and interactions with materials on the playground. In addition, the more frequent scanning of the playground compared to other observational methods enabled us to capture the ever-changing activities of young children.

As reported elsewhere (Engelen et al., 2013), introducing loose recycled materials onto the school playground increased the amount of physical activity. Nonetheless, from a holistic and developmental perspective, it is important to understand whether this intervention leads to changes in outdoor behaviours that challenge children socially and creatively. Beyond physical activity, play has many socially and developmentally important aspects (Brown, 2009; Ryan & Deci, 2001), such as sharing, imitating, leading and negotiating.

Observations using SOOP enabled us to demonstrate that play became more diverse and inactivity was reduced over the time course of the intervention. The use of low-cost, recycled and multipurpose material remained high throughout the intervention. During the intervention, the children engaged in play-related activities three quarters of the observed time, which was substantially increased from baseline observations. The introduction of loose part recycled materials had a positive effect in terms of the variety of activities and children's engagement. New types of activities (new categories) were observed during the intervention, which closely aligned to the non-purposive nature of the material. Specifically, the SPP intervention increased the variety of activities on the school playground; it promoted play, including creativity, construction and active play, and decreased inactive pursuits. Some categories of play such as constructive and creative play were only observed following the introduction of unstructured, recycled materials, possibly

because these materials were not present in baseline observations. There were some differences in how boys and girls engaged with the unstructured materials, where girls increased mainly their active and creative play, while boys increased their construction and creative play. Hence, the presence of the unstructured material stimulated an increased number of play-related activities. These results are in accordance with a recent study looking at playground activities in older children (Hyndman, Benson, & Telford, 2014a).

It is important to note that our recordings were at group rather than individual level. The changes identified using SOOP may not reflect changes for individual children. SOOP is most useful for examining whether interventions improve the playground context rather than monitoring individual progress.

Neither the school staff nor the researchers prompted the children to play with the recycled items, nor were they given ideas on their use; hence, the children seemed to have an innate drive to use the items in a creative, constructive and playful manner. Similar results were found in two previous studies in which children and staff were observed and interviewed regarding the introduction of loose items to play spaces (Armitage, 2010; Hyndman et al., 2014b). Through a variety of measures, those studies showed that the loose items improved children's participation, decision-making skills and control of play within school setting, as well as improved access for all children to inclusive play opportunities.

Strengths and limitations

The SOOP method entailed one or two observers being on location for each observation period including subsequent manual entering and coding of the observations; hence, it is labour intensive. For future studies using SOOP, multiple snapshots of baseline playground activities may be necessary to provide a comprehensive profile of pre-intervention conditions and to better capture variability in play behaviours. It would also be beneficial to include a larger sample and a more comprehensive profile of variability in intra- and inter-rater agreement. The SOOP did not require individual identification of participants which may have the advantage of protecting privacy of individuals involved in research projects. Unobtrusive methods of observation may raise ethical issues. Researchers using SOOP or similar methods in the future should ensure that appropriate consents have been obtained to ensure that participants are aware that observations are occurring.

SOOP added richness to the collected data, including a large number of scans during each observation period and important contextual data, such as social interactions and type of activity/inactivity. The data collection was performed completely unobtrusively due to placement of the researchers behind a first-floor window, from which the children appeared oblivious to the observation.

Due to the small size of the school, the sample size was quite small. In addition, we only observed a predefined area of the playground and hence could not report on impact on the entire playground.

Conclusion

The SOOP method supported an innovative means of collecting quantifiable and contextual data on children's break time activities. The modification of the playground environment by introducing recycled loose materials to school playgrounds changed children's play-related behaviour. Children's activities, both in terms of absolute time and in terms of the variety of activities, were increased. Recycled loose part materials have the potential to increase children's creative, social and physical play opportunities.

Disclosure statement

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