Journal of Environmental Psychology 54 (2017) 139–150

Contents lists available at ScienceDirect

Journal of Environmental Psychology

journal homepage: www.elsevier.com/locate/jep

Landscapes for play: Effects of an intervention to promote nature-based risky play in early childhood centres

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ARTICLE INFO

Article history:
Received 17 May 2017
Received in revised form
31 October 2017
Accepted 3 November 2017
Available online 6 November 2017

Keywords:
Outdoor play
Childcare
Play space design
Nature play
Physical activity
Psychological wellbeing

ABSTRACT

The outdoor space at childcare centres can be many preschoolers' primary experience of outdoor play. Trends prioritizing risk reduction have diminished access to nature and risky play. We examined the effects of an intervention to increase opportunities for nature and risky play in the outdoor play environments of two childcare centres using a repeated measures mixed methods design. We used the Seven Cs play space design criteria, adding natural materials to enhance affordances for play. We measured changes in play, social behaviour, psychological wellbeing, and physical activity in 45 children aged 2 to 5. Findings indicated significant decreases in depressed affect, antisocial behaviour and moderate to vigorous physical activity, and increases in play with natural materials, independent play, and prosocial behaviours. Early Childhood Educators observed improved socialization, problem-solving, focus, self-regulation, creativity and self-confidence, and reduced stress, boredom and injury. Outdoor play spaces are important for promoting children's wellbeing and development.

1. Introduction

High quality early childhood education supports child development and can attenuate the impact of social disadvantage (Lo et al., 2017). Attending childcare centres is the norm for preschoolers worldwide (OECD, 2016), including 60% of Canadian children (Sinha, 2014). While outdoor play spaces of childcare centres have received little attention, their quality can influence children's development and wellbeing, particularly since these can be the only outdoor play space children experience daily (Copeland, Khoury, & Kalkwarf, 2015; Cosco, Moore, & Smith, 2014).

Risk taking in play is fundamental to children's exploration and understanding of the world (Smith, 1998; Sutton-Smith, 2001). Risky play is thrilling play involving uncertainty and includes six categories: play at speed, at height, with dangerous tools (e.g., hammers, saws), near dangerous elements (e.g., fire, water), rough and tumble play, and play where there is a chance of getting lost (Sandseter, 2007). A systematic review found that risky outdoor play was positively associated with physical activity and social health, and negatively associated with sedentary behaviours (Brussoni et al., 2015). Other research indicates associations with risk management, self-confidence, mental health, and independence (Hüttenmoser, 1995; Lavrysen et al., 2015; Sandseter & Kennair, 2011). Despite these benefits and little evidence that risky play increases likelihood of injury (Brussoni et al., 2015), it is increasingly restricted due to perceived safety concerns (Wyver et al., 2009).

Many childcare centres struggle with providing stimulating outdoor play environments due to limited resources and safety/liability concerns (Wyver et al., 2009). The focus on risk reduction has resulted in more homogeneous outdoor play spaces with prefabricated equipment, limited natural materials and increasing limits on risky play (Herrington & Nicholls, 2007; Woolley & Lowe, 2013; Wyver et al., 2009). Children attending childcare centres and schools with play spaces containing more natural materials, and physical and cognitive challenges experience more positive social relationships, happiness and increased physical activity (Cosco et al., 2014; Farmer et al., 2017; Herrington & Lesmeister, 2006; Pivik, Herrington, & Gummerum, 2011).

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https://doi.org/10.1016/j.jenvp.2017.11.001
0272-4944/

2. Theory and research on optimal play environments

Environments and their features can be described according to the possibilities they afford for action (Gibson, 1979). Affordances vary depending on users, such that grassy fields may afford running for some children but not others with mobility impairments. Evidence favours providing versatile play environments that maximize affordances allowing children to play as they choose, including taking risks (Herrington, 1997; Sargisson & McLean, 2012; Woolley & Lowe, 2013). Affordance-rich environments support play opportunities for diverse children (e.g., differentially-abled or less socially skilled children) and help reduce gendered play (Barbour, 1999; Dyment & Bell, 2008). Less socially dominant children have higher rates of depressive symptoms, display less prosocial behaviour and less positive peer relationships (Boyce et al., 2012). Thus, interventions that promote affordances may help shift children's social hierarchies and ultimately influence their mental and physical health (Bundy et al., 2011; Herrington & Brussoni, 2015).

Natural play environments contain natural elements (e.g., plants, sand, water) as sources of play. Play in these settings is more complex, diverse and of longer duration than in equipment-based playgrounds (Luchs & Fikus, 2013; Samborski, 2010). Furthermore, ongoing and repeated exposure to nature benefits physical activity, emotion regulation, social development and readiness for learning (Gill, 2014; Gray et al., 2015; Thompson, Oliveira, Wheeler, Depledge, & van den Bosch, 2016). A greater dose of nature is associated with more benefits (Shanahan et al., 2016). Childcare centres are ideal venues for inclusion of nature given children's daily access.

Seven Cs criteria for outdoor play space design (character, context, connectivity, clarity change, chance, and challenge) prioritize use of natural materials. The highest-quality play spaces are: scaled to the child, sensitive to climate, include living materials and elements that children can manipulate (e.g., water, mud, loose parts), and spaces for individual and group play (Herrington, Lesmeister, Nicholls, & Stefiuk, 2007; see Appendix for Seven Cs characteristics). These characteristics promote affordances for play, increasing flexibility to allow children's imagination to shape play. Seven Cs have been used internationally to design children's play spaces and child-friendly neighbourhoods (Herrington & Studtmann, 1998; Herrington, 2012; Larcombe, 2010; Mountain, 2014; Sajadi & Khoshnevis, 2016).

This study is the first to investigate the effects of natural risky play environments on children's health and wellbeing. We examined the effects of a Seven Cs design intervention to increase access to nature and risky outdoor play opportunities in two childcare centres on children's play, social behaviours, mental health and physical activity.

3. Material and methods

Reported below are all measures, conditions, and data exclusions for our study.

3.1. Participants and settings

We used a convergent mixed methods repeated measures design to examine the effect of the intervention (Fig. 1) (Creswell, 2016). Data were collected at Time 1 (T1; February–April 2014) pre-intervention and Time 2 (T2; May–July 2014) two-weeks after the Seven Cs intervention to decrease the effects of novelty.

Children aged 2–5 years and the Early Childhood Educators (ECEs) at two childcare centres in Vancouver, Canada participated. The centres' outdoor play spaces scored lowest on the Seven Cs among 16 centres participating in previous research (Herrington et al., 2007; Pivik et al., 2011). The University of British Columbia/Children's and Women's Health Centre of British Columbia Research Ethics Board approved the study. ECEs provided informed consent and parents consented on behalf of their children.

Of 56 eligible children, 48 were enrolled, with complete data on 45, since three children left at T2 (Fig. 1). The final quantitative sample included 53% boys (M age = 4.28 years; SD = 0.63), 69% Caucasian, 7% Asian, 7% African, 13% Mixed. The centres did not differ significantly by gender, $\chi^2(1, N = 45) = 0.04$, $p = 0.84$, or age, $t(43) = -1.01$, $p = 0.32$. We collected complete qualitative data for eight children from Centre A and seven children from Centre B because one boy left Centre B at T2.

3.2. Measures and data analysis

3.2.1. Seven Cs

Seven Cs were assessed for each centre at each time point (see Appendix). The 27 items are rated on a 5-point scale, for a maximum score of 135. Seven Cs criteria were derived from a multidisciplinary study of outdoor play spaces at child care centres and a literature review of outdoor play spaces that support child development and integrate the unique qualities of playing outdoors (Herrington & Lesmeister, 2006). Unlike most measures of outdoor play spaces, Seven Cs assess *the quality of the design*, rather than simply auditing the presence or absence of features. Higher character, challenge and chance ratings are associated with more positive social interactions, cooperative play and less unoccupied behaviours, and higher overall Seven Cs ratings are associated with more emotionally positive interactions between children (Pivik et al., 2011).

3.2.2. Questionnaires

ECEs completed questionnaire packages for each child, including:

1. Children's sociometric status was determined by two items rating how “dominant or influential” and “popular” each child is with peers. Reliability coefficients were 0.43 and 0.66, respectively, between teacher ratings and correlated 0.46 ($p < 0.05$) with peer ratings (Ostrov & Keating, 2004).
2. Strengths and Difficulties Questionnaire (SDQ) teacher version (Goodman, 1997) includes 25 items measuring emotional symptoms (“many fears, easily scared”), conduct problems (“often loses temper”), hyperactivity/inattention (“constantly fidgeting or squirming”), peer relationship problems (“generally liked by other children”), and prosocial behaviour (“considerate of other people's feelings”). A review indicated internal consistencies above 0.70 for all teacher-reported scales, except peer problems (0.63), and test-retest from 0.68 to 0.85 (Stone, Otten, Engels, Vermulst, & Janssens, 2010). The five-factor model was confirmed in most studies with satisfactory factor loadings >0.40–≤0.70, and higher scores are associated with greater likelihood of a psychiatric diagnosis. Cronbach's alpha ranged from 0.70 to 0.88.
3. Preschool Social Behaviour Scale–Teacher Form (PSBS-T; Crick, Casas, & Mosher, 1997) includes 19 items measuring relational aggression (“tries to get others to dislike a peer”), overt aggression (“kicks or hits others”), prosocial behaviour (“is kind to peers”) and depressed affect (“looks sad”). The four-factor structure accounted for 81% of the variation, had cross-loading >0.40 and within factor loadings ranging from 0.62 to 0.90. Cronbach's alpha ranged from 0.88 to 0.96 (Crick et al., 1997).

Children's scores on the SDQ and PSBS-T were compared before and after the intervention using a Wilcoxon signed-rank test