



Correlates of children's independent outdoor play: Cross-sectional analyses from the Millennium Cohort Study

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ABSTRACT

Time spent outdoors is associated with higher levels of physical activity. To date, correlates of independent outdoor play have not been investigated. This study aimed to identify potential demographic, behavioural, environmental and social correlates of children's independent outdoor play.

Data were from the Millennium Cohort Study when children were aged 7 years. Parents reported whether their children played out unsupervised (yes/no) as well as the above mentioned correlates of unsupervised outdoor play. Children's physical activity levels were measured using waist worn accelerometry. Multiple logistic regression was used to examine associations between correlates and odds of independent (unsupervised) outdoor play. Adjusted multiple linear regression was used to estimate associations between independent outdoor play and objective measures of physical activity. Activity was measured as average daily moderate-to-vigorous activity, steps, and sedentary behaviour.

3856 ($n = 29\%$) participants were categorised as engaging in independent outdoor play. Older age, being white British, being in poverty, living in close proximity to both family friends and family, having fewer internalising problems, having more externalising conduct problems and fewer pro-social behaviours were associated with higher odds of independent outdoor play. Independent outdoor play was associated with > 2 additional minutes of moderate-to-vigorous activity ($B = 2.21$ 95% CI, 1.09 to 3.34), > 330 additional steps per day ($B = 336.66$ 95% CI 209.80 to 463.51), and nearly 5 min less time spent sedentary per day ($B = -4.91$ 95% CI $-7.54, -2.29$)

Younger children, those from a higher socio-economic-status, those isolated in location from family friends and family, and those with high levels of prosocial behaviour have lower levels of independent outdoor play. Independent outdoor play was associated with higher levels of physical activity and less time sedentary. Future interventions to promote independent outdoor play should target such populations.

1. Introduction

Regular participation in physical activity provides a plethora of health and wellbeing benefits for children (e.g., see review by Janssen and Leblanc, 2010). Consequently, many national and international guidelines have been developed advocating the importance of physical activity. UK guidelines recommend that children and young people should take part in at least 60 min of moderate-to-vigorous physical activity (MVPA) daily (Craig et al., 2009). Yet, just 22% of young

people in England meet these recommendations (Scholes, 2016). Effective physical activity promotion interventions are needed.

Although recent data are not available, a study published in 2000 suggested that outdoor play is in decline, with a 25% decrease in time spent playing observed between 1981 and 1997 in US children aged 6–8 years old (Hofferth and Sandberg, 2000). This is of concern as outdoor play contributes to active play which is a domain of physical activity. Moreover, children have been shown to be inherently more active when outside (Cooper et al., 2010; Cleland et al., 2008).

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Children's independent outdoor play is likely to be more active than that of supervised outdoor play (play with a parent/guardian; Page et al., 2009). However, to date the relationship between independent outdoor play and physical activity has not been investigated.

Identifying correlates of physical activity can inform intervention development, by highlighting potentially modifiable correlates that may bring about physical activity (e.g. physical environment), or identify characteristics of target groups most in need of intervention (e.g. demographics). A large body of literature exists on correlates of children's total physical activity (Sallis et al., 2000), time-specific physical activity (school break time and after school periods; Stanley et al., 2012), active travel (Panter et al., 2008), and sport (Allen and Vella, 2015). However, correlates of children's outdoor play (active play) have been studied less although interventions have been carried out to increase children's outdoor play with some success (Farley et al., 2007; Colabianchi et al., 2009). Demographic (sex, age, ethnicity, and socio-economic-status), behavioural (TV viewing), environmental (proximity to key locations), and social (pro-social behaviour) correlates have been consistently shown to be associated with physical activity domains (Sallis et al., 2000; Farley et al., 2007; Vancampfort et al., 2016; Smith et al., 2017). Research to investigate whether such correlates are associated with outdoor play is warranted.

The aim of the present study was to investigate associations between demographic, behavioural, environmental, and social correlates and children's independent outdoor play in a large population based sample of children residing in the UK. An additional aim was to investigate the association between independent outdoor play and activity levels.

2. Methods

The Millennium Cohort Study (MCS) is a prospective study of children born at the turn of the century (between September 2000 and January 2002) in the UK. Infants who were alive and living in the UK at age 9 months were drawn from child benefit registers, a state-provided welfare payment that covers nearly all families in the UK apart from a small group of children with non-national parents with recent or temporary immigration status. Disproportionately stratified sampling at electoral ward level ensured adequate representation of disadvantaged and ethnic minority areas. Information was collected on 18, 818 children at 9 months of age from 1 parent (usually the child's mother). Further surveys were administered at the ages of 3, 5, 7, and 11 years. All measures were collected in the child's home. In order to maximise sample size the present study used data from the age 7 survey only, where physical activity was objectively measured using waist worn accelerometry. Ethical approval was granted by the South West and London Multi-Centre Research Ethics Committees.

2.1. Exposure variables

Exposure variables were selected based on correlates that were available within the present dataset, and have been consistently shown to be associated with other physical activity domains (Sallis et al., 2000; Farley et al., 2007; Vancampfort et al., 2016; Smith et al., 2017).

2.1.1. Demographic

Parents/carers reported child(ren)'s sex, age, ethnicity (classified as White British or Other) and income (classified as above or in poverty). Trained interviewers measured children's height and weight from which body mass index (BMI) was calculated using standard formulae.

2.1.2. Behavioural

Parents were also asked to report the number of hours their child spends watching television/videos/DVDs (“on a normal week day during term time, how many hours does [child] spend watching television, videos or DVDs”). Response options were “none/less than an hour/1 h to less than 3 h/3 h to less than 5 h/5 h to less than 7 h/or 7 h

or more”. TV time was further categorised as low (< 1 h/d) and high (\geq 1 h/d).

2.1.3. Environmental

To assess the proximity with which children lived to family friends and family, parents were asked “do you have any friends/family living in this area” response options were “yes, friends/yes, family/yes, both/no.”

2.1.4. Social

Parents also completed the Strengths and Difficulties Questionnaire for their child(ren), which consists of 25 items on psychological attributes. The 25 items cover 5 sub-scales relating to emotional problems, conduct problems, hyperactivity, peer problems and pro-social behaviour. Parents are required to report to what extent a series of statements apply to their child. Response options for each statement were not true (0), somewhat true (1) or certainly true (2). Scores from the emotional and peer problems subscales were combined into an ‘internalising’ subscale and conduct problems and hyperactivity were combined into an ‘externalising’ subscale. Scores on the internalising and externalising subscales could range from 0 to 20, with a higher score indicating more difficulties. The pro-social behaviour sub-scale was used alone and therefore this subscale could range from 0 to 10, with a higher score indicating more pro-social behaviours. Scores from the emotional problems, conduct problems, hyperactivity and peer problems subscales were combined to generate a total difficulties score. The Strengths and Difficulties Questionnaire is considered a valid and reliable measure of child behavioural and emotional problems (Goodman et al., 2000).

2.2. Outcome variable

2.2.1. Active play

Parents were asked “Are there any parks, playgrounds or public spaces in the area where you live where your child(ren) can play outdoors either alone or supervised” response options were yes/no. Parents that responded yes were then asked “Does your child(ren) ever play outside on the street or in other public spaces in this area without close supervision” response options were yes/no. Only children whose parent answered yes to the first question were included in the present analyses. If parents also answered yes to the second question, the child was categorised as engaging in “independent outdoor play”. If parents answered no to the second question, the child was categorised as engaging in “no independent outdoor play.”

2.2.2. Objective physical activity data

Physical activity and sedentary time were measured objectively using Actigraph GT1M accelerometers (Actigraph, Pensacola, Florida) during the fourth wave of data collection when participants were 7 years of age (between May 2008 and August 2009). Actigraph accelerometers are a valid and reliable way to measure physical activity in young people. Full details on the accelerometry procedures have been published previously (Griffiths et al., 2013). In brief, accelerometers were delivered by mail to consenting participants and programmed to record data at 15-second intervals (15-second epoch length). Participants were instructed to wear the accelerometers around their waists during waking hours, and to take them off during water-based activities, for 7 consecutive days. Devices were returned and information was downloaded using Actigraph software. A total of 6497 children (3176 boys) met the inclusion criteria, which was set as having at least 2 days with 10 h or more of wear time. Time spent engaging in physical activities of varying intensities was derived using cutpoints generated from a prior calibration study in 7-year-old children (Pulsford et al., 2011). Specifically, time sedentary was classified as fewer than 100 counts per minute, and time in MVPA was classified as > 2241 counts per minute.

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