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Using combined GPS and accelerometer data to measure physical activity during street play events

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Background

Many children still fail to meet physical activity guidelines of 60 minutes of at least moderate intensity physical activity per day. Girls are routinely less active than boys across all age groups [1].

Street play interventions can potentially increase physical activity in children by offering a safe play space to be active in their own neighbourhood. This may be particularly valuable in urban areas where traffic and walkability are barriers to independent mobility and active travel.

Bins and volunteer residents ensure the normally-busy residential roads are traffic free

Using GPS and accelerometers, this pilot study investigated how much physical activity children obtained during managed street play events.

The street play events were approved by the local authority and took place after school between 3 and 5.30pm. Streets were closed to through traffic by residents using temporary barriers.

Methods

Participants wore a GPS receiver (QStarz BT-1000XT) and a tri-axial accelerometer (ActiGraph GT3X+) to measure outdoor physical activity during street play.

Street play takes many forms

Data were collected in 1 second epochs and combined by timestamp in Stata. Physical activity intensity was classified using appropriate thresholds for children aged ≥5 (Evenson *et al*, 2008) [2] and <5 (Pate *et al*, 2006) [3].

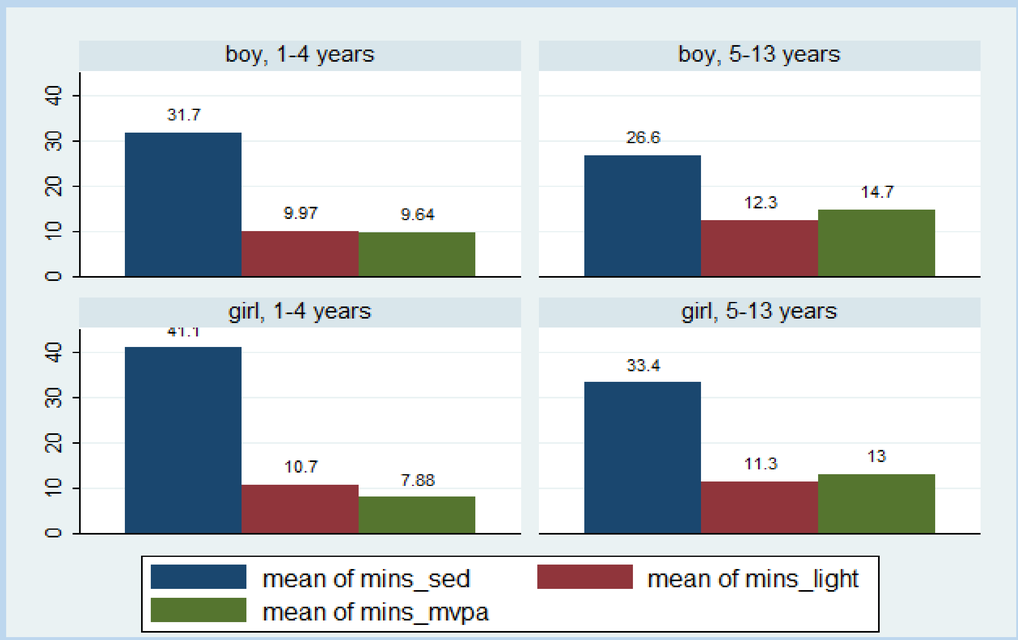
Association between moderate to vigorous physical activity (MVPA) and time outside was examined using linear regression, adjusting for age and sex.

Results

105 children aged between 1.5 years and 13 years (6.0±2.5; 57 female) were measured during five street play events in the UK. Children spent 38.9±19.8 minutes outside during the events. Time outside was a significant predictor of MVPA (β=0.16 95% CI 0.09, 0.23, p<0.001), with every additional 10 minutes outside associated with an extra 1.5 minutes (96 seconds) of MVPA.

On average 12.3±7.6 minutes was spent in MVPA, 11.2±6.9 minutes in light intensity physical activity (LPA) and 32.2±14.8 minutes sedentary per street play session. During street play sessions, MVPA and LPA did not differ significantly by sex, but girls spent more time sedentary than boys (p=0.018).

Figure 1. Mean minutes in different activity intensities by age group and gender



Conclusions

Children taking part in the street play events observed by this pilot study gained on average 20% (12.3 minutes) of their recommended daily 60 minutes of MVPA per event. This finding supports existing studies which have explored physical activity benefits of street play in Belgian neighbourhoods [4]. Notably, in this pilot study girls achieved similar LPA and MVPA compared to boys during these events suggesting that street play could be especially important for girls in helping them to increase their physical activity.

Furthermore, the amount of time spent outside during these events is directly related to the volume of MVPA accumulated. This supports existing research linking time outside to MVPA [5]. Further research exploring the optimal duration of street play events for maximising physical activity is warranted, for example, to determine whether MVPA obtained during street play is replaced or compensated for at other times of the day.

Using GPS and accelerometers provides a method to accurately quantify the impact of street play events on PA; a method which can be applied to investigate physical activity behaviour and effects in other outdoor interventions.

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