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Original research

Children's physical activity levels during organised sports practices

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ABSTRACT

Objectives: This study measured the physical activity levels of children during practice sessions of four popular organised sports in Australia.

Design: Cross-sectional observational design.

Methods: Participants comprised children from four local organised sports clubs in suburban Adelaide, South Australia. The sports examined were Australian Rules Football (AFL), girls' netball, boys' soccer and girls' soccer. Each participant wore a waist-mounted GT3X or GT3X + Actigraph accelerometer in either one or two of the practice sessions.

Results: Participants typically spent 40–50% of each sport practice session in moderate to vigorous physical activity (MVPA). Participants in the boys' soccer teams spent significantly greater time in MVPA (mean = 47% of practice time, 95% CI = 37%, 57%) than participants in the girls' netball teams (mean = 40%, 95% CI = 30%, 50%), participants in the girls' soccer teams (mean = 38%, 95% CI = 28%, 48%) and participants in the boys' AFL teams (mean = 40%, 95% CI = 36%, 44%). The practice sessions contributed approximately half of the 60 min of MVPA per day recommended by physical activity guidelines for children and young people.

Conclusions: The results suggested that organised sports provide a supportive environment for physical activity accrual; however, one practice session is insufficient for children to reach the amount of MVPA recommended in daily physical activity guidelines.

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1. Introduction

In addition to providing a number of social benefits,¹ organised sports can enable children to engage in health-enhancing physical activity. Studies have shown that children who participate in organised sports are significantly more active than those who do not.^{2–4} Further, children are more active on days that involve organised sports than on non-sport days.⁵ Many countries report more favorable organised sport participation rates than overall physical activity levels in children.⁶ Despite participating in organised sports, children may not meet daily physical activity guidelines⁷ if they do not: (a) accrue any moderate to vigorous physical activity (MVPA) outside of organised sports; (b) if their sport participation lacks frequency; or (c) if sport sessions are low in MVPA.

Only a limited number of studies have used observation or accelerometry measures to assess individuals' physical activity levels in a small selection of organised sports (including soccer, netball, basketball, baseball, flag football, softball, ice hockey, and various

styles of dance).^{5,8–14} Most studies using accelerometry measures have shown that the percentage of time that children spend in MVPA ranges from 30–55%,^{5,8–13} while one study of 8-year-old boys' reported 74% of soccer practice time was spent in MVPA.¹⁴ A number of methodological variations impede comparisons; however, studies of younger children report higher activity levels than older children, and boys are typically more active during sport than girls.^{5,10,12} Practice sessions are often more active than competitive games.^{10,14} Non-MVPA time at practice typically occurs when children are seated or standing (e.g., when they are acquiring knowledge from or being managed by the coach) or when they are engaged in light intensity skill drills.¹⁰

Increasing intensity levels during organised sports could be an effective physical activity intervention strategy. Two interventions have been designed to increase MVPA during organised sport by focusing on coach education and mentoring. Significant intervention effects were reported following the implementation of the coaching-focused interventions at girls' basketball (+14.6% MVPA)¹⁵ and girls' netball (+20.5 steps/minute) training sessions.¹⁶ The success of these interventions combined with the variability of activity levels reported across studies^{5,8–14} indicate that children's activity levels within sports could be improved. However, very few

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studies have been published on the physical activity levels of children (both male and female) of different ages across a variety of sports. A better understanding of children's activity levels is needed if successful intervention strategies for children's organised sports are to be designed and implemented. The purpose of this study was to measure the physical activity levels of children during practice sessions of four popular organised sports in Australia.

2. Methods

A convenience sample of children (participants at four local organised sport clubs in suburban Adelaide, South Australia) was recruited for this study. The sports investigated were boys' Australian Rules Football (AFL), girls' netball, boys' soccer and girls' soccer. These sports were selected due to their high participation rates across Australia.¹⁷ For the sports of interest, the number of registered suburban clubs with youth teams in the 9–13 age range was: netball=44 clubs; football=58 clubs; soccer=38 clubs. We randomly chose one club per sport within a 20 km radius of central Adelaide. Each sporting club's contact person listed on their website granted permission for researchers to approach club members and nominated three to four teams of children aged 9–13 for participation in the study. The teams were participating in age-based competitions at a similar level of competition within each age group. Each team's coach then provided written consent. Children's parents/caregivers provided written informed consent and children provided written assent. All sporting clubs contacted gave permission for involvement (4/4=100% response rate) and all team coaches from the 15 nominated teams consented (15/15=100% response rate). All of the children in the nominated four sports were invited to participate in the study (n=260 children across 15 teams). Of the children nominated, 141 agreed to participate (response rate=54.23%). Although eligible to play, no boys were registered to play netball and no girls were registered to play AFL at the selected clubs. This is reflective of the gendered participation rates in these sports at the time of the study. The University's Social and Behavioural Research Ethics Committee approved this study (Project number 7269).

Data were collected during the last month of winter competition for all sports (i.e. late July–early September) in 2016. Waist-worn GT3X and GT3X+ Actigraph (AG: ActiGraph LLC, Pensacola, FL) accelerometers were used to measure children's physical activity levels during two practice sessions (i.e., 'Visit 1' and 'Visit 2'). Previous research in children has determined there is strong agreement in both activity counts and MVPA outcomes between the Actigraph models.¹⁸ Data were collected in 15-s epochs at 30 Hz using the normal filter. ActiLife software (Version 6.13.2) was used to apply the Evenson AG cut-points for children¹⁹ and report minutes spent in intensity zones (i.e., sedentary, light, moderate, vigorous and MVPA zones). Start and end times were determined by the assigned practice times provided by each of the coaches, however participants who arrived late or finished early were noted to ensure that the accelerometry data analyses were adjusted correctly. The data were deemed valid for inclusion if the participants wore their accelerometers for at least 75% of the overall practice time. As the practice times varied across sports and participants, the outcome variables comprised the different percentages of time that participants spent in each intensity zone (i.e., sedentary, light, moderate, vigorous, and MVPA) during the practice sessions (e.g., minutes in MVPA divided by total minutes of practice). Additionally, descriptive statistics were obtained to determine the average minutes of physical activity that each participant spent in each intensity zone for all of the sports. Total activity was represented by AG vertical axis counts per minute. To date, this variable has not been widely considered in studies on habitual physical activity due to variations

in wear time; however, it was reported in the present study due to more consistent wear times.

All statistical analyses were conducted using SPSS 22 with significance set at $p < 0.05$. Initially, an Intraclass Correlation Coefficient²⁰ (ICC) was examined to assess the proportion of variance between the teams. The ICC obtained from a mixed-effects regression model showed that for both visits, a high percentage of the variability in MVPA was between teams (ICC Visit 1 = 0.33 and ICC Visit 2 = 0.34). Mixed-effects regression models²¹ comparing percentages of time in intensity zones (i.e. sedentary, light, moderate, vigorous and MVPA) across the four sports were used to accommodate for the clustering effects of teams within sports. In these models, 'sport' was entered as the fixed effect and 'teams' and 'visits' were entered as random effects. Each model was adjusted for age, sex and body mass index (BMI).

3. Results

Physical activity levels of 141 participants (51% boys) were measured during organised sports practices. The participants played in 15 teams across four sports. On average, each team comprised 10 players (range: 7–21). At each training session an average of 8 players per team wore accelerometers (range: 3–11). Of the 141 participants, 126 participated in Visit 1 and 122 participated in Visit 2. There were no significant differences between the percentages of MVPA among participants who provided data for only one visit (n = 141) and those who provided data for both visits (n = 107). In addition, there were no significant differences in participants' percentages of MVPA between Visit 1 (n = 126) and Visit 2 (n = 122). Consequently, all observations (n = 248) were included in the analyses. Table 1 provides demographic and physical activity data for the participants. No adverse effects of wearing the accelerometer on the hip during sport practices were reported.

Fig. 1 compares percentages of practice time spent in intensity zones across the sports. Notably, pair-wise comparison of the mixed effects model showed that participants in the boys' soccer teams spent the least amount of time engaged in sedentary activities (M = 12.20%, 95% CI = 11.15%, 23.25%). Participants in the boys' soccer teams also spent significantly more time in MVPA (M = 46.74%, 95% CI = 36.54%, 56.92%) than did participants in the girls' netball team (M = 40.02%, 95% CI = 30.28%, 49.74%), girls' soccer team (M = 38.15%, 95% CI = 28.33%, 47.96%) and boys' AFL team (M = 40.49%, 95% CI = 36.46%, 44.53%). Table 2 provides the results for the full mixed-effects model in which boys' AFL is used as the reference category as it had the highest number of participants. The R² shows the variance explained by 'sport' as the fixed effect and 'teams' and 'visits' as the random effects. All five models were significant at $p < 0.001$.

4. Discussion

This study revealed that participants typically engaged in 40–50% MVPA during each organised sports practice session. On average, participants spent 32 min in MVPA during each organised sports practice session and thus engaged in approximately 50% of the 60 min of recommended daily MVPA.⁷ Activity levels were influenced by the sport, the team and the individual practice session (visit). While it is not surprising that participants in the same team during the same practice session would have relatively similar activity levels to each other due to participation in the same activities and drills as instructed by the coach, these results highlight the opportunity for physical activity change by targeting coaching strategies. Pair-wise comparisons revealed that after accounting for clustering by team and training session participants' physical activity levels did not vary considerably across the sports investigated,

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