The correlates of preschoolers' compliance with screen recommendations exist across multiple domains

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ABSTRACT

Objective. To investigate the individual, social and physical environment correlates of preschool children's compliance with Australian/Canadian and American Academy of Pediatrics (AAP) screen recommendations.

Method. An Ecological Model (EM) was used to identify constructs potentially associated with children's screen time. In 2008–2009, parents in Melbourne, Australia, reported their child's screen time and on a range of potential correlates. Children (n = 935; 54% boys, mean age 4.54 ± 0.70 years) were assessed as meeting or not meeting each of the screen recommendations. Logistic regression assessed bivariable and multivariable associations.

Results. In total, 15 explanatory variables, across the three domains of the EM were associated with boys' and/or girls' compliance with either Australian/Canadian or AAP recommendations. Correlates varied by sex and recommendation. Maternal television viewing time was the only consistent correlate for both boys' and girls' compliance with both recommendations. No demographic groups were identified as being less likely to comply with screen recommendations.

Conclusion. Public health programs should take account of the sex-specific nature of correlates of preschool children's screen time. Preschool children across all demographic groups need support to engage in less screen use. Parents may benefit from education and parenting skills to minimize potentially harmful effects of excessive screen time for their child.

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Introduction

Screen time, particularly television viewing, is associated with multiple health, psychosocial and developmental (Leblanc et al., 2012) outcomes in young children. Although some studies suggest that the identified adverse outcomes of television viewing (e.g. sleep problems (Garrison and Christakis, 2012)) may be associated with content, the bulk of evidence suggests it is the volume which is detrimental (Tomopoulos et al., 2010). This evidence has informed the development of Australian (Australian Department of Health and Aging, 2009) and Canadian (Tremblay et al., 2012) recommendations, suggesting that children younger than two years should engage in no recreational screen use (i.e. television, computer and electronic game use) and those aged three to five years should participate in one hour or less per day. The American Academy of Pediatrics (AAP) (2001), recommends no screen time for children under two years and less

than two hours per day for older children (AAP Committee on Public Education, 2001).

Recent studies show that a large proportion of preschool children exceed the recommended amount of screen time (78% of Australian 3–5 year old children exceed Australian/Canadian recommendations (Hinkley et al., 2012b); 44% of American children aged 3–4 years exceed AAP recommendations (Vandewater et al., 2007)). Investigation of modifiable correlates is therefore warranted. As the recommended amount of screen time for preschool children varies between countries, correlates may also vary (Wijtzes et al., 2012), as restricting children to less than one hour per day may have different challenges for parents than restricting children to two hours per day. Investigation of potential correlates against both the Australian/Canadian and AAP recommendations is warranted to: ensure comparability with existing literature which primarily focuses on the AAP recommendations; provide identification of potential correlates of the more stringent and recent recommendations from Australia and Canada which have not previously been reported; identify a broad range of potential correlates for researchers and public health practitioners to target in future interventions; and provide broader, cross-country application in the international literature.

Bronfenbrenner's bioecological perspective (Bronfenbrenner, 2005) provides a series of frameworks, commonly referred to as ecological models (EM), for conceptualizing and identifying potential correlates of behaviors. In this study, the framework is operationalized consistent

with Davison and Birch (2001) and previous research in child physical activity and screen behaviors (Hinkley et al., 2010; Sallis et al., 2000). The outcome of interest is considered the central point of a series of nested domains. Individual characteristics (biologic, demographic and psychological) populate the most proximal domain. Social characteristics, including familial traits, are included within the second domain, with characteristics of broader community and physical environments populating the third, most distal domain. Studies in preschool children's screen behaviors have typically focused on a few potential correlates within just one domain of the EM, neglecting the possibility of interactions between domains and the broader contexts in which correlates occur, both essential components of EM (Bronfenbrenner, 2005; Davison and Birch, 2001). For instance, characteristics such as access to playgrounds may be important to consider when investigating children's screen compliance as they may provide opportunities for children to engage in alternate behaviors or be indicative of broader neighborhood qualities.

The aim of this study was to employ the EM to conceptualize and identify those factors associated with preschool children's compliance with Australian/Canadian and AAP recommendations for daily screen time.

Methods

Recruitment and participants

Data were drawn from the baseline phase of the Healthy Active Preschool Years (HAPPY) Study when children were aged three to five years. HAPPY is a cohort study that investigates correlates of physical activity and sedentary behaviors in children during the preschool period, tracking changes in those behaviors through transition to school. Recruitment and data collection methods have previously been described (Hinkley et al., 2012c).

Measures and data management

Outcome variables

Parents reported their child's total time in week (Monday–Friday) and weekend (Saturday–Sunday) day television/video/DVD viewing, computer use, and sedentary electronic game use via a reliable, previously published survey (Hinkley et al., 2012a). Week and weekend day time in each of the behaviors were summed to determine total weekly screen time (test–retest reliability ICC = 0.68, 95% CI 0.52–0.83) and divided by seven to determine average daily screen time. Children were assessed as meeting Australian/Canadian recommendations if they spent one hour or less, and AAP recommendations if they spent two hours or less, in average daily screen time across the week. We ran alternate models which required children to meet the respective recommendations on both week and weekend days as the outcome. Differences in the models were minimal and results for these alternate models are therefore not reported.

Explanatory variables

Individual variables included child anthropometrics, physical activity, demographic/biological, psychological and other behavioral characteristics. Child anthropometrics (used to derive child BMI) and physical activity measures have previously been described in detail (Hinkley et al., 2012c). Other individual level variables (including parent reported height and weight used to determine BMI and maternal education used to represent socio-economic position (SEP)), as well as all social and physical environment variables, were reported by parents. Development, test–retest and internal reliability of the HAPPY survey have been previously described (Hinkley et al., 2012a). Only those items identified as reliable (ICC > 0.5 for continuous variables; Kappa ≥0.6 or % agreement ≥60% for categorical variables) were included in analyses (see Appendix).

Data analysis

Descriptive statistics were used to present characteristics of the sample and children's compliance with Australian/Canadian and AAP screen recommendations. Chi-square tests assessed differences in compliance between boys and girls. Logistic regression with a binomial family and logit transformation to account for the binary nature of the outcome variable (Hardin and Hilbe, 2007) was used to examine associations between potential correlates and compliance

with recommendations. Separate models were constructed for boys and girls and for each of the outcome variables. Each predictor variable was entered individually into each of the models with each outcome variable for boys and girls. Although no differences were found in compliance between boys and girls (Hinkley et al., 2012b), correlates of physical activity have been shown to vary between the sexes (Hinkley et al., 2012c). Additionally, several significant differences were noted in explanatory variables between boys and girls (data not presented). All analyses undertaken controlled for age and clustering by center of recruitment.

Explanatory variables which showed a significant association ($P < .01$) in bivariable analyses were identified. The more stringent P value was chosen to counter the likely increased rate of Type 1 error occurring due to the large number of statistics produced at this stage of analyses. Multivariable logistic regression was used to assess the relative contribution of correlates in each EM domain. Explanatory variables which showed a significant bivariable association were entered in three subgroups; individual, social and physical environment variables. The relative improvement to the model by the addition of each of the second and third subgroups of variables was assessed using χ^2 tests of the differences in the log likelihood of each of the successive models. All analyses were undertaken in STATA (version 11, STATA Corp, College Station, TX).

Results

Descriptive characteristics for the sample have previously been reported (Hinkley et al., 2012b, 2012c). The final sample included 935 children (n = 504 boys) with complete screen time data. Boys spent an average of 114.8 (95% CI 108.3, 121.3) and girls 109.7 (95% CI 102.9, 116.5) minutes per day in screen time. Across the week, few children (21.8%) met Australian/Canadian recommendations while slightly more than half (58.9%) met AAP recommendations. On weekdays, 35.5% and 72.0%, and on weekend days 29.3% and 59.5%, of children met the Australian/Canadian and AAP recommendations, respectively.

Bivariable analyses identified nine variables to be included in the boys' multivariable model for Australian/Canadian recommendations and 12 variables for AAP recommendations. Among girls, 13 variables were included in the multivariable model for Australian/Canadian recommendations and 33 variables for AAP recommendations. After the initial inclusion of individual domain variables, all models showed significant improvement at each step.

Results for associations between correlates and boys' compliance with Australian/Canadian and AAP recommendations are presented in Tables 1 and 2, respectively. In the full models, two explanatory variables were associated with boys' compliance with both sets of recommendations, and a further six explanatory variables were associated with boys' compliance with either Australian/Canadian or AAP recommendations. These included four individual variables, three social variables and one physical environment variable. At the individual level, for every additional hour boys spent playing active electronic games, they were 85% and 39% less likely to meet the Australian/Canadian and AAP recommendations, respectively. Individual level correlates associated with a decreased likelihood of boys' compliance with recommendations were an increase in the amount of time in quiet play (with Australian/Canadian recommendations) and child's preference to play electronic games rather than be active. Boys were more likely to meet AAP recommendations with more sleep and greater attendance at preschool/childcare.

At the social level, with every additional hour of television their mother watched, boys were 10% and 11% less likely to meet Australian/ Canadian and AAP recommendations, respectively. Boys were less likely to meet AAP recommendations with additional encouragement from their mothers to be active but were more likely to meet Australian/ Canadian recommendations if their parents reported they had the confidence to say no to their child's requests to play computer/electronic games. The one physical environment correlate associated with a reduced likelihood of boys' compliance with Australian/Canadian recommendations was among those who lived on a cul-de-sac.

Tables 3 and 4 present the results of the multivariable models for girls. Three correlates were associated with girls' compliance with