Office-Based Randomized Controlled Trial to Reduce Screen Time in Preschool Children

WHAT'S KNOWN ON THIS SUBJECT: Interventions to reduce screen time in preschool-aged children are promising.

WHAT THIS STUDY ADDS: A screen time intervention in 3-year-old children implemented in the primary care setting did not reduce screen time or BMI.

abstract

FREE

OBJECTIVE: To determine if an intervention for preschool-aged children in primary care is effective in reducing screen time, meals in front of the television, and BMI.

METHODS: A randomized controlled trial was conducted at a primary care pediatric group practice in Toronto, Canada. Three-year-old children and their parents were randomly assigned to receive a short behavioral counseling intervention on strategies to decrease screen time. The primary outcome 1 year later was parent reported screen time. Secondary outcomes included television in the child's bedroom, number of meals in front of the television, and BMI.

RESULTS: In the intention-to-treat analysis at 1 year, there were no significant differences in mean total weekday minutes of screen time (60, interquartile range [IQR]: 35–120 vs 65, IQR: 35–120; $P = .68$) or mean total weekend day minutes of screen time (80, IQR: 45–130 vs 90, IQR: 60–120; $P = .33$) between the intervention and control group. Adjusting for baseline BMI, there was a reduction in the number of weekday meals in front of the television (1.6 ± 1.0 vs 1.9 ± 1.2; $P = .03$) but no differences in BMI or number of televisions in the bedroom.

CONCLUSIONS: This pragmatic trial was not effective in reducing screen time or BMI but was effective in reducing meals in front of the screen. Short interventions focused solely on reducing screen time implemented in the primary care practice setting may not be effective in this age group. *Pediatrics* 2012;130:1110–1115

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KEY WORDS

screen time, television, meal, preschool, obesity, health, clinical trial

ABBREVIATION

IQR—interquartile range

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Children are spending an increasing amount of their time engaged in screen time. Screen time, defined as time spent watching television, DVDs, or videos or playing computer or video games, has been associated with important health outcomes in children including delayed language development, aggressive behavior, cigarette smoking,[1–3] and obesity.[4–10] Interventions aimed at reducing screen time have been a focus of childhood obesity prevention and treatment of the past decade and have yielded varying results.[11,12] A recent systematic review of 13 studies examining screen time interventions in children showed that, overall, there were no effects on screen time or BMI.[12] A subgroup analysis including the 2 studies performed with preschool-aged children did identify a reduction in screen time.[5,13] Neither of these studies were implemented in the primary care practice setting.[12] There is compelling evidence that obesity prevention should be focused on preschool-aged children.[14,15] This evidence includes the following: overweight begins at a young age and persists,[16] parents have control over feeding and activity of their children at this age,[17] and children who learn and adopt healthy behaviors are more likely to engage in those practices as adults.[18] Primary care physicians are among the only professionals who see nearly all preschool-aged children, and their anticipatory guidance is a powerful source of parenting information for young families.[19,20] Thus, primary care physicians are ideally positioned to influence lifestyle behaviors of the family. A review of prevention interventions in primary care practice has identified a substantial gap in the evidence for practice.[21] The primary objective of this pragmatic randomized controlled trial was to determine if a simple intervention aimed at preschool-aged children, applied at the annual health maintenance visit, in the primary care setting, would be effective in reducing screen time. The secondary objective was to determine if the intervention was effective in reducing the proportion of children eating meals in front of the television and reducing BMI.

METHODS

This study was a pragmatic, parallel group, randomized controlled trial. Pragmatic trials are designed and conducted to answer important questions facing patients, clinicians, and policy makers. They compare ≥2 interventions that are directly relevant to clinical care or health care delivery and strive to assess those interventions' effectiveness in real-world practice.[22]

Participants

Three-year-old children and their parents were recruited at their 3-year health maintenance visit from a 3-physician (SJ, MP, CT), community-based, primary care pediatric group practice located in Toronto, Canada. This practice is participating in TARGet Kids! (Toronto Applied Research Group), a university-affiliated, practice-based, primary care research network. Children were excluded if they had limitations in vision or hearing, ambulation, or cognitive delay because this could affect their screen time use and their ability to implement the intervention.

Intervention

The intervention was modeled around previously published screen-time interventions[23,24] and used embedded concepts of goal setting, positive reinforcement, monitoring, and cognitive restructuring.[25] Parents in the intervention group received a 10-minute behavioral counseling intervention by trained study personnel directly after the health maintenance visit, which included information on the health impact of screen time in children and provided strategies to decrease screen time. These strategies included suggestions such as removing the television from the child's bedroom, encouraging meals to be eaten without the television on, and budgeting of the child's screen time. Families were encouraged to try a 1-week television turn off, in which children were encouraged to spend time without the television and were provided with a calendar and stickers to reward the children for days without the television. Contingency planning for time spent not watching television was promoted. Activities for the child, during this session, included providing a story to parents about television viewing (*The Berenstain Bears and Too Much TV*) and creating a list of non-television-related activities. The intervention group also received a Canadian Pediatric Society handout titled "Promoting Good Television Habits."[26] Parents of children in both the intervention and control groups received standardized counseling from trained study personnel on safe media use, which included information on television rating systems, Internet safety, and limiting exposure to violent programming. They both received a previously published Canadian Pediatric Society parent handout titled "Managing Media in the Home."

The study personnel who delivered the intervention had graduate-level training in dietetics and were trained by the research team by using scripts and role-playing during a half-day training session before initiation of the trial. The research assistant had monthly meetings with the research team to discuss progress with the trial and address issues related to the intervention. The research assistant had content knowledge on screen time and healthy eating behaviors. There was no additional observation of the research assistant performing the intervention or the follow-up assessment.

Outcomes

The primary outcome was parent-reported screen time defined as total time in minutes the child was in a room with the television or video/DVD on or playing video games or using the Internet during the previous weekday and the previous weekend day. Secondary outcomes included intermediate measures identified from the literature to be associated with screen time, including presence of the television in the child's bedroom and parent report of the number of meals the child ate in front of the television on the last weekday and weekend day,[27,28] as well as adiposity measures including BMI. Outcomes were measured at 1-year follow-up during the 4-year-old scheduled health maintenance visit. Survey data (at baseline and at 1-year follow-up) were collected at the health maintenance visit, by using a standardized, parent-completed, data collection form adapted from the Canadian Community Health Survey and the literature on screen time.[29]

Sample Size

Based on NHANES data, preschool-aged children view on average 14 hours per week of screen time.[30] In a trial by Dennison et al, children in the intervention group watched 5 hours less television per week, compared with the control group. To detect a minimally important difference of 5 hours per week and maintain a power of 80% and 2-sided α of .05, the sample size required was estimated to be 70 children per group. To account for a 15% dropout rate, we randomly assigned 80 children to each group.

Randomization

Patients were consented to the trial then assigned randomly by using a computerized, random-number generator. Assignment was concealed through the use of sequentially numbered, opaque, identical, sealed envelopes. The assignment sequence was generated by the study epidemiologist (MM), and then a research assistant enrolled participants and assigned participants to their groups. Baseline characteristics were collected after randomization and group assignment.

Blinding

Attending pediatricians and study personnel who conducted the 1-year outcome assessments were blinded to the group assignments. Although blinding of parents to the educational intervention was not possible, parents were not informed of the group assignment, the main outcome measures, or the study hypothesis, except that it was a study on preschool media use. Parents in the 2 groups were asked not to discuss the study with parents of other children.

Statistical Analyses

An intention-to-treat (intervention group versus control group) analysis was performed. Differences between continuous variables were analyzed by using the Student *t* test, and differences between categorical variables were analyzed by using the Fisher exact χ^2. Screen time was log transformed because of skewed distribution. Adjustments for outcome baseline values, zBMI, by using World Health Organization normal values at baseline and follow-up, were accomplished through linear regression modeling (maximum likelihood estimates for parameters determination), with weekday screen time (minutes) and weekend day screen time (minutes) at 1 year as the outcome variables and group assignment as the exposure variable. Secondary analyses were conducted by using the same methods but with number of meals in front of the screen, television in the bedroom, and zBMI as outcomes. All data were analyzed by using SAS 9.2 (SAS Institute, Cary, NC).

Ethics Approval

Parents provided written informed consent. This study was approved by the research ethics board of the Hospital for Sick Children, and the study protocol was registered with clinicaltrials.gov (trial # NCT00959309).

RESULTS

Over the study period, 351 children were scheduled to attend a 3-year-old visit in the practice; 187 of these children were assessed for eligibility and approached for consent to participate in the study. One hundred sixty families were assigned randomly to intervention or control groups, with 79% and 86% follow-up in the intervention and control groups, respectively (see Fig 1). There were no baseline differences between the intervention and control group for age, gender, maternal education and employment, television ownership, total weekday and weekend day screen time, meals in front of the screen, television in the bedroom, parent screen time, or maternal BMI. The intervention group had a clinically significantly higher BMI *z* score at baseline, compared with the control group (0.66 $\pm$ 1.18 vs 0.30 $\pm$ 0.83; see Table 1).

Intention-to-Treat Analysis

In the intention-to-treat analysis at 1 year, there were no significant differences in mean total weekday minutes of screen time (60 minutes, interquartile range [IQR]: 35–120 vs 65 minutes, IQR: 35–120; $P = .68$), or mean total weekend day minutes of screen time (80 minutes, IQR: 45–130 vs 90 minutes, IQR: 60–120, $P = .33$), between the intervention and control groups (see Table 2). After adjusting for the baseline BMI group imbalance, there was a reduction in the number of weekday meals in front of the television (1.6 $\pm$ 1.0 vs 1.9 $\pm$ 1.2; $P =$

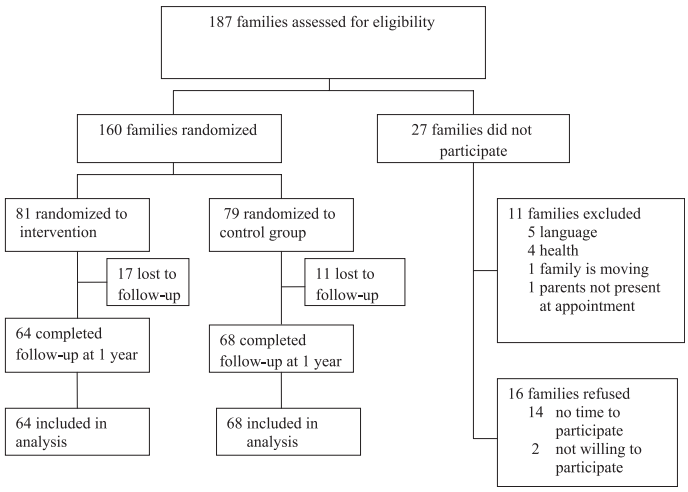

FIGURE 1
Participant flow through the trial.

.03), but no differences were seen in BMI or number of television sets in the bedroom (see Table 2). At 1-year follow-up, subjects in the intervention group compared with the control group reported they were more likely to recommend this counseling session to others (89% vs 63%; $P = .002$).

DISCUSSION

This pragmatic, randomized controlled trial of a brief behavioral intervention administered to parents and 3-year-old children during a health maintenance visit did not result in a reduction in the primary outcome measure of reported screen time or a secondary outcome measure of BMI. There was a statistically significant reduction in meals in front of the screen, a secondary outcome measure, by >2 screen meals per week.

One of the major strengths of our study was the pragmatic nature of the intervention. We chose to test the intervention at the 3-year-old visit, when no routine vaccinations are scheduled. The intervention itself targeted behaviors shown in the literature to be associated with increased screen time, such as eating in front of the screen,[27] and television in the bedroom,[5] and factors associated with reducing screen time such as the presence of a family rule about screen time.[27] A study from Quebec, Canada, showed that nearly 25% of children reported eating at least twice daily in front of the television, and those who ate snacks while watching TV had increased risk for other poor dietary practices such as soft drink consumption.[28] Meals in front of the screen in school-aged children have also been shown to be associated with increased caloric intake, alterations in satiety signals, and place children at risk for direct food advertising.[31–33]

A recently published meta-analysis of screen-time interventions showed overall no effect of screen-time interventions on BMI or screen time. Our study confirms these findings in preschool-aged children. A secondary analysis of these studies in a recent meta-analysis on screen time interventions showed that the 2 included studies in preschool-aged children were effective in reducing screen time, with a point estimate of −3.72 hours (95% confidence interval −7.23 to 0.20) per week of screen time.[6] Differences in our study, compared with these 2 studies, may include the lower "dose" and the pragmatic "setting" of the intervention itself; for example, the trial by Dennison et al[5] included seven 1-hour sessions for children in a preschool setting and multiple parent handouts over an 18-month time period. Of note, all 13 studies in the meta-analysis were implemented in a single setting (school, home, or nutrition clinic), and none included the primary care practice setting. There may be certain interventions that are more amenable to implement in the primary care setting. A recently published pragmatic trial from the

TABLE 1 Baseline Characteristics

Characteristics	Intervention group, $n = 64$	Control group, $n = 68$
Demographics		
Age (y), mean (± SD)	3.12 (0.19)	3.08 (0.12)
Gender (male), *n* (%)	28 (44)	33 (49)
Attends day care or preschool, *n* (%)	43 (67)	53 (78)
Mother born in Canada, *n* (%)	42 (66)	41 (63)
Mother completed university degree, *n* (%)	52 (81)	59 (87)
Mother employed, *n* (%)	52 (81)	53 (78)
Anthropometrics		
BMI,[a] mean (± SD)	16.5 (1.8)	15.9 (1.1)
zBMI,[a] mean (± SD)	0.66 (1.2)	0.30 (0.8)
Mother's BMI, mean (± SD)	22.6 (3.3)	22.5 (4.1)
Screen-time factors		
Weekday screen time (minutes per day), median (IQR)	60 (40–120)	75 (45–150)
Weekend day screen time (min/d), mean median (IQR)	70 (55–130)	113 (60–145)
Number of televisions,[a] mean (± SD)	1.8 (0.8)	2.1 (1)
Number meals with television, mean (± SD)	1.9 (1.1)	1.9 (1.1)
Television in the bedroom, *n* (%)	7 (11)	2 (3)
Household screen-time rule, *n* (%)	50 (78)	52 (78)

[a] Controls: $n = 67$.

TABLE 2 Mean Between Groups Difference in Outcomes From Baseline to 1-Year Follow-up

Outcome	Baseline Intervention	Control	Follow-up Intervention	Control	Adjusted Mean Difference (95% Confidence Intervals)	*P* Value
Weekday screen time (min), mean (± SD)	94 (101)	104 (91)	85 (81)	89 (77)	−7 (−38 to 23)	.65
Weekend screen time (min), mean (± SD)	116 (133)	114 (81)	107 (91)	107 (93)	2 (−16 to 20)	.80
zBMI, mean (± SD)	0.66 (1.18)	0.30 (0.83)	0.38 (1.06)	0.14 (0.93)	0.01 (−0.22 to 0.24)	.94
Number meals with television, *n* (%)	1.9 (1.1)	1.9 (1.1)	1.6 (1.0)	1.9 (1.2)	−0.34 (−0.64 to −0.04)	.03
Television in the bedroom, *n* (%)	7 (11)	2 (3)	11 (17)	3 (4)	+5 (−2 to 11)	.14

TARGet Kids! team[19] examined the outcomes of an educational intervention for parents of 9-month-old children to transition from bottle use to cup. We hypothesize that this new behavior (cup use) was successfully maintained over the follow-up period, because parents are unlikely to transition back to bottle use after cup use is established. Complex behavior change such as reducing overall screen time may require repeated reinforcement, and flexible, developmentally appropriate approaches that change with age. Limitations of the study include potential for contamination among intervention and control families; a cluster randomized controlled trial design by practice site may be more effective. The lack of a standardized method of measuring and reporting screen time in preschool-aged children is an important limitation in this field of research. We used parent report of child screen time.[2,4,24,29] There is evidence that parent report of child screen time provides accurate estimates of television viewing times, compared with videotaped observation; $r = .70$.[34] The education levels of mothers in our cohort are high, but similar to education levels of women in this age group in Toronto.[35]

We may have diluted the effective difference between control and intervention group screen time by using a screen-time based counseling session for the control group (selection of screen time programs and Internet safety). The fidelity of the intervention was not monitored, and the intervention was delivered by a single trained study staff member, by using a standardized protocol. This would not, however, be expected to alter the effective difference between control and intervention group. The outcome was measured after 12 months; it is possible there was a significant reduction in reported screen time after the intervention that did not persist.

Preventive care interventions in early childhood have potential for improving health outcomes. A recent randomized controlled trial in the primary care setting was effective in selective lifestyle behavior changes.[36] In addition, there have been no cost-effectiveness analyses of primary care interventions for health promotion in children published. Studies on physical activity promotion and cessation in adults were shown to be cost-effective for interventions that focused on individual behavior change and were implemented in practice.[37,38] The health benefits associated with reduced screen time during meals have not been established in young children, and, if implemented as an additional counseling service at the primary care visit, would be a significant cost. For example, if we calculate direct costs for physician counseling for all children in Ontario attending a primary care practice and use an existing fee code for smoking cessation counseling in Ontario,[39] the cost would be >C$2 million annually.

CONCLUSIONS

This pragmatic trial of a brief intervention in the primary care setting was not effective in reducing screen time or BMI in 3-year-old children. In addressing screen time and obesity prevention interventions in primary care, identifying which behaviors to target, how best to format and deliver the intervention, integration of interventions across settings, and an assessment of cost-effectiveness should be a focus for future research.

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