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Participant characteristics and intervention processes associated with reductions in television viewing in the High Five for Kids study

Elizabeth M. Cespedes[1,2,3], **Christine M. Horan**[1], **Matthew W. Gillman**[1,3], **Steven L. Gortmaker**[2], **Sarah Price**[1], **Sheryl L. Rifas-Shiman**[1], **Kathleen Mitchell**[4], and **Elsie M. Taveras**[1,5]

[1]Obesity Prevention Program, Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, MA

[2]Department of Society, Human Development and Health, Harvard School of Public Health, Boston, MA

[3]Department of Nutrition, Harvard School of Public Health, Boston, MA

[4]Harvard Vanguard Medical Associates; Boston, MA

[5]Division of General Pediatrics, MassGeneral Hospital for Children; Boston, MA

Abstract

Objective—To evaluate the High Five for Kids intervention effect on television (TV) within subgroups, examine participant characteristics associated with process measures and assess perceived helpfulness of TV intervention components.

Method—High Five (RCT of 445 overweight/obese 2–7 year-olds in Massachusetts [2006–2008]) reduced TV by 0.36 hours/day. 1-year effects on TV, stratified by subgroup, were assessed using linear regression. Among intervention participants (n=253), associations of intervention component helpfulness with TV reduction were examined using linear regression and associations of participant characteristics with processes linked to TV reduction (choosing TV and completing intervention visits) were examined using logistic regression.

Results—High Five reduced TV across subgroups. Parents of Latino (v. white) children had lower odds of completing >=2 study visits (OR 0.39 [95%CI: 0.18, 0.84]). Parents of black (v. white) children had higher odds of choosing TV (OR: 2.23 [95% CI: 1.08, 4.59]), as did parents of obese (v. overweight) children and children watching >=2 hours/day (v. <2) at baseline. Greater perceived helpfulness was associated with greater TV reduction.

Corresponding author: Elizabeth Cespedes, Departments of Nutrition and Epidemiology, Harvard School of Public Health; Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, 133 Brookline Avenue, 6th floor, Boston, MA 02215. Telephone: 617-285-3608. Fax: 617-859-8112. emc611@mail.harvard.edu.

Conclusion—Clinic-based motivational interviewing reduces TV in children. Low cost education approaches (e.g., printed materials) may be well-received. Parents of children at higher obesity risk could be more motivated to reduce TV.

Introduction

Television (TV) viewing is highly prevalent among children, particularly those from low income and racial/ethnic minority families. (Certain and Kahn, 2002; Ford et al., 2002) Many studies have shown associations between young children's TV viewing and prevalence of obesity, (Anderson et al., 2001; Gortmaker et al., 1996; Kimbro et al., 2011; Tremblay et al., 2011) as well as other adverse health and psychosocial outcomes including irregular sleep (Thompson and Christakis, 2005) and behavioral problems. (Rideout and Hamel, 2006)

Previous interventions have attempted to reduce TV viewing as an obesity prevention strategy, (Bluford et al., 2007; Dennison et al., 2004; Epstein et al., 2008; Escobar-Chaves et al., 2010; Fitzgibbon et al., 2005; Ford et al., 2002; Goldfield et al., 2006; Harrison et al., 2006; Ni Mhurchu et al., 2009; Robinson et al., 2003; Salmon et al., 2008; Schmidt et al., 2012; Todd et al., 2008) and a recent meta-analysis of interventions focused on reducing children's screen time have a small but significant effect (summary estimate over all studies was −0.15 hours/day [95% CI: −0.22 to −0.10]). (Maniccia et al., 2011)

Evidence that TV viewing tracks from early into later childhood suggests that preschool may be a promising period for preventive intervention. (Anderson et al., 2001; Certain and Kahn, 2002; Proctor et al., 2003) Among randomized controlled trials that have focused on preschool-aged children, (Anderson and Whitaker, 2010; Dennison et al., 2004; Epstein et al., 2008; Fitzgibbon et al., 2005, 2006; Fitzgibbon et al., 2011) few have succeeded in reducing TV/video viewing. (Dennison et al., 2004; Epstein et al., 2008; Fitzgibbon et al., 2005) Though only a small number of interventions have focused on young children in clinical settings, (McCallum et al., 2007; Ray et al., 1994; Schwartz et al., 2007) a recent systematic review highlighted clinic-based counseling as an effective approach for reducing screen time among young children and emphasized the need to better understand key components of this approach. (Schmidt et al., 2012)

In order to effectively reduce TV/video-viewing, interventionists must first understand what health education components and processes are effective and in what subpopulations these strategies are successful. The High Five for Kids study, a primary care based cluster-randomized controlled trial of overweight and obese 2–6.9 year-olds, only significantly reduced BMI among girls and low income participants but was effective in reducing overall TV/video viewing by 0.36 hours/day. Year 1 analyses found two process measures (choosing to work on reducing TV and participating in >=2 intervention activities) were associated with greater reductions in TV. (Taveras et al., 2011) The purpose of this study was to evaluate the effect of High Five for Kids on TV reduction within subgroups, examine participant characteristics associated with key process measures and assess perceived helpfulness of TV intervention components.

Methods

Participants

We studied children participating in the High Five for Kids intervention, a cluster randomized controlled trial in 10 pediatric offices of Harvard Vanguard Medical Associates (HVMA), a multisite group practice in Massachusetts. Eligible children were ages 2.0 – 6.9 years whose body mass index (BMI) was > 95th percentile or whose BMI was 85th-<95th percentile if at least one parent was overweight (BMI >= 25 kg/m2) and who received their pediatric care at any of the 10 pediatric offices of HVMA between August 2006 and October 2008. We excluded: 1) children whose parent or guardian could not respond to interviews in English or Spanish, 2) children whose families were planning to leave HVMA, 3) families for whom the primary care clinician thought the intervention was not appropriate, and 4) children with chronic medical conditions. Details of recruitment procedures and the 1-year intervention outcomes are available elsewhere. (Taveras et al., 2011) Of the 475 children initially recruited, 253 (93%) in the intervention and 192 (94%) in the usual care arm had 1-year outcome data available including BMI and a behavioral survey.

Intervention Design

Trained pediatric nurse practitioners intervened using motivational interviewing during four 25-minute, in-person chronic disease management visits and two 15-minute telephone calls. The nurse practitioners delivered educational modules targeting TV/video viewing (as well as fast food and sugar-sweetened beverage intake and other behaviors). High Five also provided intervention families with printed and electronic tools for self-management support, including lists of local resources for physical activity and an interactive website. In addition, the nurse practitioners offered interested families an electronic TV monitoring device to assist with the goal of reducing TV/video viewing.

Measurements

At baseline, research staff contacted parents of eligible children and completed a telephone interview after obtaining verbal informed consent. Participants were enrolled once we confirmed their BMI at the scheduled well child care visit and we received written informed consent. At 1-year (post-intervention), participants again completed a telephone interview. All study procedures were reviewed and approved by the Harvard Pilgrim Health Care Institute Institutional Review Board.

Participant characteristics and baseline behaviors—In a baseline interview with research staff, parents reported their educational attainment, annual household income, the child's age, sex, race/ethnicity, and whether there was a TV in the room where the child slept. Research staff confirmed height and weight using measurements in the electronic health record from the most recent well-child care visit.

Main outcome—The main outcome was change in TV/video viewing from baseline to 1 year measured in hours/day. We assessed child TV/video viewing via parent-report using validated measures from the National Longitudinal Study of Youth (NLSY). (Baker et al., 1993) The NLSY measures have been linked in a dose-response manner to incidence of

child obesity, (Gortmaker et al., 1996) and while parental reports show some limitations (parents slightly overestimate children's TV time compared to diaries or direct observation), they are commonly used in nationally representative surveys (ensuring comparability) and correlate well with videotaped observational measures (r= .60). (Anderson et al., 1985; Bryant et al., 2007) Further details on the measurements are available in the 1-year paper from this trial. (Taveras et al., 2011)

Process measures and helpfulness of intervention components—At 1-year follow-up surveys, parents in the intervention arm reported whether they had chosen to work on specific behaviors, including TV, and which intervention components they had found helpful in changing those behaviors (e.g., nurse practitioner chronic disease management visits with educational modules, telephone calls from pediatric nurse practitioners, and printed and/or electronic tools for self-management support). We also culled data from the electronic medical records on completed study visits and telephone calls.

Statistical Analysis

We calculated mean TV/video viewing by intervention assignment and subgroup separately for baseline and 1-year follow-up. We then calculated change in TV/video viewing from baseline to 1 year. We used linear regression models to estimate the intervention's effect on reducing TV/video viewing within subgroups defined by: child age at baseline (</>=60 months); child sex (male/female); child race/ethnicity (black/Latino/white/other); child BMI percentile category at baseline (85th to <95th/>=95th); child baseline TV/video viewing (</>= 2 hours/day); parent educational attainment (some college or below/college graduate); parental BMI at baseline (<25/25– <30/>=30); and annual household income (</>=$50,000). We stratified by subgroup and compared intervention to control participants within these restricted samples using linear regression models adjusted for child age, sex, race/ethnicity; parent education and BMI category at baseline; household income; and exact time elapsed from baseline to follow-up. Using the full, unrestricted sample, we also assessed interactions of each subgroup variable with change in TV/video viewing (Table 1). For discussion in the results section, we calculated confidence intervals around group differences using the formulas provided by Altman et al. (Altman and Bland, 2003)

Among intervention arm participants, we used logistic regression models adjusted for child age, sex, and race/ethnicity; parent education and overweight/obesity status at baseline; household income; and exact time elapsed from baseline to follow-up to assess characteristics associated with two process measures previously associated with greater reduction in TV. These process measures were: 1) completing >=2 intervention visits (intervention dose) and 2) choosing to work on reducing TV and video time (choosing TV). Table 2 presents descriptive results, and Table 3 shows model estimates for the associations between participant characteristics and the two process measures.

Among intervention participants choosing to work on reducing TV, we conducted descriptive analyses of how helpful participants considered each of the intervention's health education components (Table 4). We also used linear regression models adjusted for child age, sex, and race/ethnicity; parent education and overweight/obesity status at baseline;

household income; and exact time elapsed from baseline to follow-up visit to assess the associations of perceived helpfulness of intervention components with change in parent-reported change in TV/video time (Table 4).

To account for intraclass correlation, we performed analyses using generalized linear mixed models that accounted for clustering by practices (PROC GLIMMIX in SAS version 9.3; SAS Institute Inc., Cary, North Carolina).

Results

This study included children ages 2.0 – 6.9 years that were already overweight or obese at baseline: child mean (SD) age was 4.9 (1.2) years and baseline BMI z-score (SD) was 1.85 (0.63). Overall, participants were 43% non-white and 48% female (n=445). Two thirds of participants in the intervention arm (n=159) selected reducing TV/video viewing as a target behavior for their child. Table 1 shows sample characteristics by intervention assignment and participant subgroup. Characteristics of the full study sample have been reported previously.(Taveras et al., 2011)

Subgroup Analyses

Analyses of change in TV/video viewing by intervention assignment and subgroup are presented in Table 1. In multivariable models fit separately for each subgroup, we estimated that the intervention reduced TV/video viewing among children in all subgroups. We observed differences in magnitude of at least 0.20 hours/day in the estimated intervention effect on TV/video viewing between the following subgroups: comparing intervention to control participants, the intervention reduced TV/video viewing by 0.20 hours/day (95% CI: −0.75, 0.36) more among females than males; 0.29 hours/day (95% CI: −0.83, 0.26) more among children that were obese rather than overweight at baseline; 0.30 hours/day (95% CI: −0.85, 0.25) more among children of overweight rather than obese parents; and 0.40 hours/day (95% CI: −0.86, −0.07) more in children who viewed >=2 hours/day of TV/video v. <2 hours/day at baseline. Interaction terms were not significant.

Process Measures

Table 2 shows change in TV/video viewing according to two process measures previously linked to greater reductions in TV: completing >=2 visits with a study nurse practitioner and choosing TV reduction from a menu of target overweight-related behaviors. Table 3 shows multivariable adjusted associations of participant characteristics with the two process measures.

Compared to usual care, reductions in TV/video viewing among families completing >=2 intervention visits or that chose to work on reducing TV time were of greater magnitude than those achieved by families attending <2 intervention visits or who did not choose TV as a target behavior (Table 2). Parents of Latino (v. white) children had lower odds of completing >=2 intervention visits (OR: 0.39 [95% CI: 0.18, 0.84]). Child TV/video viewing at baseline, child BMI percentile at baseline and parent weight status were not associated with attendance at intervention visits (Table 3).

Parents of black (v. white) children had greater odds of choosing to work on reducing TV/video viewing (OR: 2.23 [95% CI: 1.08, 4.59]), as did parents of obese (v. overweight) children (OR: 1.81 [95% CI: 1.05, 3.14]), and parents of children watching >=2 hours/day (v. <2) of TV/video at baseline (OR: 2.40 [95% CI 1.33, 4.33]). Parental weight status, educational attainment, child sex and household income were not associated with choosing to reduce TV/video viewing (Table 3).

Helpfulness of Intervention Components

Table 4 presents descriptive analysis of how helpful intervention participants choosing to work on reducing TV/video perceived different health education components. Among parents who received nurse practitioner study visits, nearly all considered the visits to be "somewhat" or "very" helpful in reducing their child's TV/video viewing. A large proportion of those who received them also found the Berenstain Bears children's book "Too Much TV" and TV intervention handouts helpful. A smaller majority found nurse practitioner phone calls and the tracking calendar with reward stickers to be helpful. Parents were divided on whether the High Five for Kids website was helpful. As expected, the more helpful the parent perceived a given intervention component, the greater the child's estimated reduction in TV/video time (Table 4).

Discussion

This study found that the High Five for Kids intervention consistently reduced TV/video viewing in all subgroups compared to usual care, although pre-post intervention differences did not always achieve statistical significance. With respect to process measures associated with greater reductions in TV/video viewing (intervention dose and choosing TV), parents of Latino children had lower odds of attendance at intervention visits and parents of black children, obese children and children watching >= 2 hours/day of TV/video at baseline had greater odds of choosing TV as a target behavior. We also found that the more helpful a parent perceived a given intervention component, the greater the child's reduction in TV/video viewing.

Prior analyses of the High Five intervention hypothesized that the greater intervention effect on BMI observed among children from low-income, black and Latino households could be explained by these children having higher BMI at baseline and therefore "more room to move." (Taveras et al., 2011) The same may hold true for reductions in TV/video viewing; for example, we estimated a greater magnitude of intervention effect on reducing TV/video viewing among children who were obese at baseline and these children also watched more TV at baseline than their overweight counterparts. Since interaction terms were not statistically significant, observed differences in the magnitude of effect within subgroups do not necessarily represent true differences in the intervention effect on reducing TV: interventions targeting overweight-related behaviors *may* show greater effect amongst "high risk" children (those who are already obese or who watch high levels of TV) but more research is needed to confirm this strategy. In line with this possibility, we also found greater odds of choosing to work on TV among parents of black children, obese children, and children watching >=2 hours/day. This finding could be explained by greater motivation

and recognition of the need to address overweight-related behaviors among families of children from groups disproportionately burdened by childhood obesity (e.g. African Americans) or at higher risk of poor outcomes (already obese children and children with high TV/video viewing).

Consistent with other studies that have found racial/ethnic minority status to be associated with poor attendance and attrition in family-based pediatric interventions targeting weight loss, (Williams et al., 2010) we found Latino parents had lower odds of completing >=2 intervention visits. High Five employed various retention strategies including a child-friendly mascot, project branding, and small incentives such as water bottles, an art contest, birthday cards and a seasonal newsletter. Clinical staff received an educational packet highlighting key concepts of cross-cultural care, and intervention visits and educational materials were offered in Spanish.(Harvard Pilgrim Health Care Institute, 2008) In qualitative data from 1-year follow-up surveys participants mentioned the need to seek reimbursement rather than receiving an up-front voucher for co-pays and parking costs as a barrier to participation. This is a possible reason for lack of attendance by lower income participants, including Latinos.

Results from this process analysis confirm that provider guidance delivered through motivational interviewing can help parents make behavioral changes. As expected, greater perceived helpfulness of nurse practitioner visits and phone calls was associated with greater reductions in TV. Importantly, though many participants did not receive study phone calls, the calls were highly effective for reducing TV among the small group of families that received them and rated them as “very helpful.” Phone calls are a low cost way to deliver health education information; ensuring more intervention participants receive calls through persistent contact and incentives could increase the effectiveness of interventions to reduce screen time in young children. Few studies have explored the role of parental motivation to change or acceptance of motivational interviewing as a counseling strategy among families with overweight or obese children; this could be an area for future research that could help tailor intervention components to participant needs. (Limbers et al., 2008; Schwartz, 2010; Schwartz et al., 2007; Tripp et al., 2011; Walpole et al., 2011)

Intervention trials in older children show that greater reductions in TV predict greater reductions in BMI, (Tremblay et al., 2011) and a recent meta-analysis of 68 effective interventions to promote healthy weight in children found that reduced TV viewing was the intervention strategy that achieved the greatest reductions in BMI. (Luckner et al., 2012) However, greater reductions in TV were not associated with greater reductions in BMI in High Five for Kids. This could be because of the participants’ young age or because the intervention did not show effects on diet; one proposed pathway linking screen time and BMI is energy intake during viewing and exposure to food advertising. Given evidence that TV/video viewing in young children tracks into later childhood and adolescence,(Certain and Kahn, 2002) the reductions in TV/video achieved by the High Five intervention may still represent sustained behavioral changes impacting long-term weight trajectories. (Taveras et al., 2011)

Strengths

High Five had sufficient numbers to examine subgroups of baseline BMI percentile and race/ethnicity; few studies of pediatric obesity have addressed subgroup effects and none that we know of has examined TV reduction among subgroups. Further, the High Five trial offered a unique opportunity to examine processes of change in an intervention that included unique components such as training nurse practitioners to employ motivational interviewing techniques to promote change in TV/video viewing, among other overweight-related behaviors.

Limitations

Although we used validated measures to assess behavioral outcomes, parents may have exaggerated improvements in behaviors when self-reporting the hours/day their child watched TV and videos at follow-up; this is a possible reason for the non-significant association between reduction in TV and reduction in BMI. Further, this study may have been underpowered to detect underlying differences or an effect of the intervention.in select subgroups (e.g. children of normal weight parents). While perceived helpfulness of TV intervention components was associated with greater reductions in TV, it is possible that these associations are the result of reverse causation; helpfulness was measured at follow-up simultaneously with TV/video time and while 95% of participants choosing TV reported on the helpfulness of intervention components, not all participants received all intended intervention components due to lack of adherence to the intervention protocol (Tables 2 and 4). Despite the intervention's success in reducing TV/video viewing, it is important to note that at 1-year follow-up 47% of intervention children still exceeded the =<2 hours per day recommended by the American Academy of Pediatrics. Further work is needed to reduce the screen time exposure of young children to recommended levels. (American Academy of Pediatrics Committee on Public Education, 2001)

Conclusion

Motivational interviewing can be an effective approach to reducing young children's TV/video viewing in clinic-based interventions. Lower cost health education approaches (e.g., printed materials) may also be well-received and effective. Further research is needed to confirm whether there are true differences by subgroup in the effect of clinic-based counseling on TV/video viewing, and whether focusing obesity prevention efforts on counseling parents of children at the highest risk of poor outcomes will lead to greater intervention effects on overweight-related behaviors.

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References

Altman DG, Bland JM. Statistics Notes: Interaction revisited: the difference between two estimates. BMJ: British Medical Journal. 2003:326.

American Academy of Pediatrics Committee on Public Education. American Academy of Pediatrics: Children, adolescents, and television. Pediatrics. 2001; 107:423–426. [PubMed: 11158483]

Anderson DR, Field DE, Collins PA, Lorch EP, Nathan JG. Estimates of young children's time with television: a methodological comparison of parent reports with time-lapse video home observation. Child Dev. 1985; 56:1345–1357. [PubMed: 4053746]

Anderson DR, Huston AC, Schmitt KL, Linebarger DL, Wright JC. Early childhood television viewing and adolescent behavior: the recontact study. Monogr Soc Res Child Dev. 2001; 66:1–147. I-VIII.

Anderson SE, Whitaker RC. Household routines and obesity in US preschool-aged children. Pediatrics. 2010; 125:420–428. [PubMed: 20142280]

Baker, P.; Keck, C.; Mott, F.; Quinlan, S. Center for Human Resource Research. Columbus: Ohio State University; 1993. NLSY Child Handbook: A Guide to the 1986-90 National Longitudinal Survey of Youth Child Data. Rev ed.

Bluford DA, Sherry B, Scanlon KS. Interventions to prevent or treat obesity in preschool children: a review of evaluated programs. Obesity (Silver Spring). 2007; 15:1356–1372. [PubMed: 17557972]

Bryant MJ, Lucove JC, Evenson KR, Marshall S. Measurement of television viewing in children and adolescents: a systematic review. Obes Rev. 2007; 8:197–209. [PubMed: 17444962]

Certain LK, Kahn RS. Prevalence, correlates, and trajectory of television viewing among infants and toddlers. Pediatrics. 2002; 109:634–642. [PubMed: 11927708]

Dennison BA, Russo TJ, Burdick PA, Jenkins PL. An intervention to reduce television viewing by preschool children. Arch Pediatr Adolesc Med. 2004; 158:170–176. [PubMed: 14757609]

Epstein LH, Roemmich JN, Robinson JL, Paluch RA, Winiewicz DD, Fuerch JH, Robinson TN. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. Arch Pediatr Adolesc Med. 2008; 162:239–245. [PubMed: 18316661]

Escobar-Chaves SL, Markham CM, Addy RC, Greisinger A, Murray NG, Brehm B. The Fun Families Study: intervention to reduce children's TV viewing. Obesity (Silver Spring). 2010; 18(Suppl 1):S99–S101. [PubMed: 20107469]

Fitzgibbon ML, Stolley MR, Schiffer L, Van Horn L, KauferChristoffel K, Dyer A. Two-year follow-up results for Hip-Hop to Health Jr.: a randomized controlled trial for overweight prevention in preschool minority children. J Pediatr. 2005; 146:618–625. [PubMed: 15870664]

Fitzgibbon ML, Stolley MR, Schiffer L, Van Horn L, KauferChristoffel K, Dyer A. Hip-Hop to Health Jr. for Latino preschool children. Obesity (Silver Spring). 2006; 14:1616–1625. [PubMed: 17030973]

Fitzgibbon ML, Stolley MR, Schiffer LA, Braunschweig CL, Gomez SL, Van Horn L, Dyer AR. Hip-Hop to Health Jr. Obesity Prevention Effectiveness Trial: postintervention results. Obesity (Silver Spring). 2011; 19:994–1003. [PubMed: 21193852]

Ford BS, McDonald TE, Owens AS, Robinson TN. Primary care interventions to reduce television viewing in African-American children. Am J Prev Med. 2002; 22:106–109. [PubMed: 11818179]

Goldfield GS, Mallory R, Parker T, Cunningham T, Legg C, Lumb A, Parker K, Prud'homme D, Gaboury I, et al. Effects of open-loop feedback on physical activity and television viewing in overweight and obese children: a randomized, controlled trial. Pediatrics. 2006; 118:e157–e166. [PubMed: 16818530]

Gortmaker SL, Must A, Sobol AM, Peterson K, Colditz GA, Dietz WH. Television viewing as a cause of increasing obesity among children in the United States: 1986-1990. Arch Pediatr Adolesc Med. 1996; 150:356–362. [PubMed: 8634729]

Harrison M, Burns CF, McGuinness M, Heslin J, Murphy NM. Influence of a health education intervention on physical activity and screen time in primary school children: 'Switch Off--Get Active'. J Sci Med Sport. 2006; 9:388–394. [PubMed: 16872900]

Harvard Pilgrim Health Care Institute. Department of Population Medicine Obesity Prevention Program. High Five for Kids Toolkit. 2008. http://www.populationmedicine.org/research/OPP/high-five-kids-toolkit

Kimbro RT, Brooks-Gunn J, McLanahan S. Young children in urban areas: links among neighborhood characteristics, weight status, outdoor play, and television watching. Soc Sci Med. 2011; 72:668–676. [PubMed: 21324574]

Limbers CA, Turner EA, Varni JW. Promoting healthy lifestyles: Behavior modification and motivational interviewing in the treatment of childhood obesity. J Clin Lipidol. 2008; 2:169–178. [PubMed: 21291736]

Luckner H, Moss JR, Gericke CA. Effectiveness of interventions to promote healthy weight in general populations of children and adults: a meta-analysis. Eur J Public Health. 2012; 22:491–497. [PubMed: 21967748]

Maniccia DM, Davison KK, Marshall SJ, Manganello JA, Dennison BA. A metaanalysis of interventions that target children's screen time for reduction. Pediatrics. 2011; 128:e193–e210. [PubMed: 21708797]

McCallum Z, Wake M, Gerner B, Baur LA, Gibbons K, Gold L, Gunn J, Harris C, Naughton G, et al. Outcome data from the LEAP (Live, Eat and Play) trial: a randomized controlled trial of a primary care intervention for childhood overweight/mild obesity. Int J Obes (Lond). 2007; 31:630–636. [PubMed: 17160087]

Ni Mhurchu C, Roberts V, Maddison R, Dorey E, Jiang Y, Jull A, Tin Tin S. Effect of electronic time monitors on children's television watching: pilot trial of a home-based intervention. Prev Med. 2009; 49:413–417. [PubMed: 19744507]

Proctor MH, Moore LL, Gao D, Cupples LA, Bradlee ML, Hood MY, Ellison RC. Television viewing and change in body fat from preschool to early adolescence: The Framingham Children's Study. Int J Obes Relat Metab Disord. 2003; 27:827–833. [PubMed: 12821969]

Ray R, Lim LH, Ling SL. Obesity in preschool children: an intervention programme in primary health care in Singapore. Ann Acad Med Singapore. 1994; 23:335–341. [PubMed: 7944246]

Rideout, V.; Hamel, E. Henry, J., editor. The media family: Electronic media in the lives of infants, toddlers, preschoolers and their parents. Kaiser Family Foundation. 2006. http://kaiserfamilyfoundation.files.wordpress.com/2013/01/7500.pdf

Robinson TN, Killen JD, Kraemer HC, Wilson DM, Matheson DM, Haskell WL, Pruitt LA, Powell TM, Owens AS, et al. Dance and reducing television viewing to prevent weight gain in African-American girls: the Stanford GEMS pilot study. Ethn Dis. 2003; 13:S65–S77. [PubMed: 12713212]

Salmon J, Ball K, Hume C, Booth M, Crawford D. Outcomes of a grouprandomized trial to prevent excess weight gain, reduce screen behaviours and promote physical activity in 10-year-old children: switch-play. Int J Obes (Lond). 2008; 32:601–612. [PubMed: 18253162]

Schmidt ME, Haines J, O'Brien A, McDonald J, Price S, Sherry B, Taveras EM. Systematic review of effective strategies for reducing screen time among young children. Obesity (Silver Spring). 2012; 20:1338–1354. [PubMed: 22222926]

Schwartz RP. Motivational interviewing (patient-centered counseling) to address childhood obesity. Pediatr Ann. 2010; 39:154–158. [PubMed: 20302247]

Schwartz RP, Hamre R, Dietz WH, Wasserman RC, Slora EJ, Myers EF, Sullivan S, Rockett H, Thoma KA, et al. Office-based motivational interviewing to prevent childhood obesity: a feasibility study. Arch Pediatr Adolesc Med. 2007; 161:495–501. [PubMed: 17485627]

Taveras EM, Gortmaker SL, Hohman KH, Horan CM, Kleinman KP, Mitchell K, Price S, Prosser LA, Rifas-Shiman SL, et al. Randomized controlled trial to improve primary care to prevent and manage childhood obesity: the High Five for Kids study. Arch Pediatr Adolesc Med. 2011; 165:714–722. [PubMed: 21464376]

Thompson DA, Christakis DA. The association between television viewing and irregular sleep schedules among children less than 3 years of age. Pediatrics. 2005; 116:851–856. [PubMed: 16199693]

Todd MK, Reis-Bergan MJ, Sidman CL, Flohr JA, Jameson-Walker K, Spicer-Bartolau T, Wildeman K. Effect of a family-based intervention on electronic media use and body composition among boys aged 8--11 years: a pilot study. J Child Health Care. 2008; 12:344–358. [PubMed: 19052191]

Tremblay MS, LeBlanc AG, Kho ME, Saunders TJ, Larouche R, Colley RC, Goldfield G, Connor Gorber S. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. Int J Behav Nutr Phys Act. 2011; 8:98. [PubMed: 21936895]

Tripp SB, Perry JT, Romney S, Blood-Siegfried J. Providers as weight coaches: using practice guides and motivational interview to treat obesity in the pediatric office. J Pediatr Nurs. 2011; 26:474–479. [PubMed: 21930034]

Walpole B, Dettmer E, Morrongiello B, McCrindle B, Hamilton J. Motivational interviewing as an intervention to increase adolescent self-efficacy and promote weight loss: methodology and design. BMC Public Health. 2011; 11:459. [PubMed: 21663597]

Williams NA, Coday M, Somes G, Tylavsky FA, Richey PA, Hare M. Risk factors for poor attendance in a family-based pediatric obesity intervention program for young children. J Dev Behav Pediatr. 2010; 31:705–712. [PubMed: 21057255]

HIGHLIGHTS

- We examine processes by which High Five for Kids reduced TV/video-viewing.
- High Five consistently reduced TV across subgroups defined by sex, BMI, race, etc.
- Attendance and choosing to work on TV were associated with greater TV reduction.
- Parents of obese and high TV children were more likely to choose to work on TV.
- Low cost clinic-based intervention components (e.g. printed materials) were well-received.

Table 1

Change in children's TV/video viewing by participant subgroup and intervention assignment

		TV/ video viewing (hours/day)			Unadjusted			Adjusted[a]		
		Baseline	1 Year	Change	Estimate (95% CI); Change, hours/day	p	Int-p	Estimate (95% CI); Change, hours/day	p	Int-p
	N (%)		Mean (SD)							
Total										
Intervention	253 (57)	2.7 (1.6)	2.1 (1.1)	−0.53 (1.46)	−0.46 (−0.71, −0.20)	0.001		−0.36 (−0.63, −0.08)	0.01	
Usual Care	192 (43)	2.4 (1.3)	2.4 (1.2)	−0.07 (1.22)	0.0 (ref)			0.0 (ref)		
Baseline child age, months							0.78			0.66
<60										
Intervention	119 (47)	2.6 (1.6)	2.1 (1.1)	−0.53 (1.51)	−0.48 (−0.91, −0.04)	0.03		−0.38 (−0.84, 0.07)	0.10	
Usual Care	65 (34)	2.4 (1.4)	2.4 (1.3)	−0.06 (1.26)	0.0 (ref)			0.0 (ref)		
>=60										
Intervention	133 (53)	2.7 (1.5)	2.1 (1.2)	−0.52 (1.41)	−0.44 (−0.76, −0.12)	0.01		−0.38 (−0.73, −0.02)	0.04	
Usual Care	127 (66)	2.4 (1.3)	2.4 (1.2)	−0.08 (1.21)	0.0 (ref)			0.0 (ref)		
Child sex							0.59			0.95
Male										
Intervention	132 (52)	2.7 (1.5)	2.2 (1.2)	−0.53 (1.51)	−0.52 (−0.90, −0.15)	0.01		−0.22 (−0.65, 0.20)	0.31	
Usual Care	98 (51)	2.6 (1.4)	2.6 (1.3)	−0.01 (1.32)	0.0 (ref)			0.0 (ref)		
Female										
Intervention	121 (48)	2.6 (1.6)	2.1 (1.1)	−0.52 (1.4)	−0.38 (−0.73, −0.04)	0.03		−0.42 (−0.78, −0.06)	0.02	
Usual Care	94 (49)	2.2 (1.2)	2.1 (1.1)	−0.14 (1.12)	0.0 (ref)			0.0 (ref)		
Child race/ethnicity							0.70			0.54
Black										
Intervention	70 (28)	2.8 (1.9)	2 (1.3)	−0.7 (1.73)	−0.22 (−1.17, 0.73)	0.64		−0.13 (−1.13, 0.87)	0.80	
Usual Care	14 (7)	3 (1.3)	2.5 (1.2)	−0.51 (0.94)	0.0 (ref)			0.0 (ref)		
Latino										
Intervention	48 (19)	3 (1.5)	2.4 (1.1)	−0.6 (1.7)	−0.44 (−1.24, 0.36)	0.27		−0.47 (−1.32, 0.37)	0.27	
Usual Care	26 (14)	2.9 (1.6)	2.8 (1.3)	−0.16 (1.53)	0.0 (ref)			0.0 (ref)		
White										
Intervention	118 (47)	2.5 (1.4)	2.1 (1.1)	−0.36 (1.09)	−0.32 (−0.63, −0.01)	0.04		−0.27 (−0.60, 0.07)	0.12	

		TV/ video viewing (hours/day)			Unadjusted			Adjusted[a]		
		Baseline	1 Year	Change	Estimate (95% CI); Change, hours/day	p	Int-p	Estimate (95% CI); Change, hours/day	p	Int-p
	N (%)		Mean (SD)							
Usual Care	134 (70)	2.4 (1.3)	2.4 (1.2)	−0.02 (1.2)	0.0 (ref)			0.0 (ref)		
Other										
Intervention	17 (7)	2.7 (1.8)	1.9 (1)	−0.78 (1.69)	−0.79 (−2.21, 0.62)	0.26		−1.08 (−2.71, 0.55)	0.18	
Usual Care	18 (9)	1.7 (0.9)	1.7 (1)	−0.02 (1.1)	0.0 (ref)			0.0 (ref)		
Baseline child BMI category							0.09			0.11
85th-<95th percentile										
Intervention	118 (47)	2.4 (1.5)	2.1 (1.2)	−0.31 (1.28)	−0.21 (−0.57, 0.15)	0.24		−0.21 (−0.61, 0.18)	0.29	
Usual Care	77 (40)	2.3 (1.4)	2.2 (1.1)	−0.1 (1.16)	0.0 (ref)			0.0 (ref)		
>=95th percentile										
Intervention	135 (53)	2.9 (1.6)	2.2 (1.1)	−0.72 (1.58)	−0.66 (−1.03, −0.30)	0.00		−0.50 (−0.89, −0.11)	0.01	
Usual Care	115 (60)	2.5 (1.3)	2.5 (1.3)	−0.06 (1.27)	0.0 (ref)			0.0 (ref)		
Baseline child TV/video viewing							0.95			0.80
<2 hours/day										
Intervention	86 (34)	1.17 (0.46)	1.53 (0.90)	0.38 (0.83)	−0.03 (−0.30, 0.23)	0.80		−0.06 (−0.36, 0.23)	0.68	
Usual Care	77 (40)	1.28 (0.42)	1.70 (0.92)	0.41 (0.88)	0.0 (ref)			0.0 (ref)		
>=2 hours/day										
Intervention	167 (66)	3.43 (1.39)	2.44 (1.14)	−0.99 (1.49)	−0.60 (−0.97, −0.23)	0.002		−0.46 (−0.82, −0.10)	0.01	
Usual Care	115 (60)	3.21 (1.15)	2.81 (1.16)	−0.40 (1.31)	0.0 (ref)			0.0 (ref)		
Parent educational attainment							0.68			0.67
Some college or below										
Intervention	106 (42)	2.9 (1.6)	2.3 (1.2)	−0.61 (1.6)	−0.39 (−0. 95, 0.17)	0.17		−0.37 (−0.94, 0.19)	0.20	
Usual Care	65 (34)	3.1 (1.5)	2.8 (1.3)	−0.24 (1.47)	0.0 (ref)			0.0 (ref)		
College graduate										
Intervention	147 (58)	2.5 (1.6)	2 (1.1)	−0.47 (1.35)	−0.49 (−0.79, −0.19)	0.001		−0.36 (−0.73, 0.08)	0.06	
Usual Care	127 (66)	2.1 (1.1)	2.1 (1.1)	0.01 (1.07)	0.0 (ref)			0.0 (ref)		
Baseline parent weight status							0.08			0.06
Normal weight (BMI <25)										
Intervention	8 (3)	2.9 (2)	1.7 (0.8)	−1.14 (1.85)	−2.21 (−4.55, 0.13)	0.06		−0.99 (−13.82, 11.85)	0.51	
Usual Care	9 (5)	1.6 (0.8)	2.3 (1.6)	0.73 (1.18)	0.0 (ref)			0.0 (ref)		

		TV/ video viewing (hours/day)			Unadjusted			Adjusted[a]		
		Baseline	1 Year	Change	Estimate (95% CI); Change, hours/day	p	Int-p	Estimate (95% CI); Change, hours/day	p	Int-p
	N (%)		Mean (SD)							
Overweight (BMI 25–<30)										
Intervention	90 (36)	2.5 (1.4)	2.1 (1.1)	−0.41 (1.3)	−0.47 (−0.82, −0.11)	0.01		−0.46 (−0.84, −0.09)	0.02	
Usual Care	99 (52)	2.1 (1.2)	2.2 (1.2)	0.05 (1.15)	0.0 (ref)			0.0 (ref)		
Obese (BMI >=30)										
Intervention	154 (61)	2.8 (1.6)	2.2 (1.2)	−0.57 (1.53)	−0.26 (−0.65, 0.13)	0.19		−0.16 (−0.56, 0.25)	0.43	
Usual Care	84 (44)	2.9 (1.4)	2.6 (1.2)	−0.31 (1.27)	0.0 (ref)			0.0 (ref)		
Annual household income							0.77			0.60
<=$50,000										
Intervention	88 (35)	2.9 (1.6)	2.2 (1.2)	−0.73 (1.59)	−0.51 (−1.26, 0.24)	0.18		−0.48 (−1.22, 0.26)	0.20	
Usual Care	38 (20)	3.1 (1.5)	2.9 (1.2)	−0.24 (1.47)	0.0 (ref)			0.0 (ref)		
>$50,000										
Intervention	160 (65)	2.5 (1.5)	2.1 (1.1)	−0.44 (1.38)	−0.40 (−0.68, −0.12)	0.01		−0.34 (−0.65, −0.03)	0.03	
Usual Care	153 (80)	2.3 (1.2)	2.2 (1.2)	−0.04 (1.15)	0.0 (ref)			0.0 (ref)		

P-values account for clustering using PROC GLIMMIX.

[a] Adjusted for child age, sex, and race/ethnicity; parent education and overweight/obesity status at baseline; household income; and exact time elapsed from baseline to follow-up visit.

Table 2

Change in children's TV/video viewing among intervention participants by process measure

		TV/ video viewing (hours/day)			Unadjusted		Adjusted[a]	
		Baseline	1 Year	Change	Estimate (95% CI); Change, hours/day	p	Estimate (95% CI); Change, hours/day	p
	N (%)		Mean (SD)					
Intervention dose >=2 visits								
No	116 (46)	2.5 (1.6)	2.2 (1.3)	−0.32 (1.39)	−0.25 (−0.55, 0.05)	0.11	−0.13 (−0.47, 0.21)	0.46
Yes	137 (54)	2.8 (1.6)	2.1 (1)	−0.71 (1.49)	−0.63 (−0.93, −0.34)	<.0001	−0.51 (−0.89, −0.14)	0.01
Usual Care	192 (43)	2.4 (1.3)	2.4 (1.2)	−0.07 (1.22)	0.0 (ref)		0.0 (ref)	
Parent chose to work on reducing TV								
No	93 (37)	2.3 (1.6)	1.9 (1.2)	−0.38 (1.28)	−0.32 (−0.63, −0.01)	0.04	−0.30 (−0.62, 0.03)	0.07
Yes	159 (63)	2.9 (1.5)	2.3 (1.1)	−0.61 (1.55)	−0.54 (−0.83, −0.25)	0.0004	−0.38 (−0.71, −0.06)	0.02
Usual Care	192 (43)	2.4 (1.3)	2.4 (1.2)	−0.07 (1.22)	0.0 (ref)		0.0 (ref)	

P-values account for clustering using PROC GLIMMIX.

[a]Adjusted for child age, sex, and race/ethnicity; parent education and overweight/obesity status at baseline; household income; and exact time elapsed from baseline to follow-up visit

Table 3

Factors associated with intervention families completing >=2 visits and choosing to work on TV

	N=253	Intervention dose >= 2 visits Odds Ratio (95% CI)[a]	Choosing TV Odds Ratio (95% CI)[a]
Child sex			
Female v. Male		1.20 (0.69, 2.07)	0.84 (0.49, 1.44)
Child race/ethnicity			
Black v. White		0.56 (0.27, 1.18)	2.23 (1.08, 4.59)
Latino v. White		0.39 (0.18, 0.84)	0.99 (0.48, 2.07)
Other v. White		1.38 (0.40, 4.78)	0.69 (0.23, 2.08)
Parent educational attainment			
Some college or below v. college or above		0.77 (0.41, 1.47)	1.21 (0.63, 2.33)
Annual household income			
<$50,000 v. >=$50,000		0.65 (0.33, 1.27)	1.01 (0.50, 2.02)
Parent weight status			
Normal (BMI<25) v. Obese (BMI>=30)		0.46 (0.10, 2.25)	0.78 (0.17, 3.54)
Overweight (BMI 25–<30) v. Obese (BMI>=30)		0.92 (0.51, 1.66)	0.67 (0.38, 1.20)
Child TV and video viewing at baseline			
>=2 hours/day v. <2 hours/day		1.69 (0.92, 3.10)	2.40 (1.33, 4.33)
Child BMI category			
Obese (>=95th percentile) v. overweight (85th-<95th)		0.65 (0.37, 1.13)	1.81 (1.05, 3.14)

P-values account for clustering using PROC GLIMMIX.

[a] Adjusted for child age, sex, and race/ethnicity; parent education and parent overweight/obesity status at baseline; household income; and exact time elapsed from baseline to follow-up visit.

Table 4

Association of helpfulness of intervention components with change in TV/video viewing among intervention families choosing to reduce TV/video

Intervention Components	N	(%)	Estimate (95% CI)[a] Change, hours/day	p
Helpfulness of study visits with nurse practitioner				
Not applicable (did not receive)	39	(26)	−0.27 (−1.39, 0.86)	0.64
Somewhat helpful	48	(32)	−0.81 (−1.90, 0.27)	0.14
Very helpful	54	(36)	−1.11 (−2.20, −0.03)	0.04
Not very helpful	10	(7)	0.0 (ref)	
Study phone calls with nurse practitioner				
Not applicable (did not receive)	97	(64)	−0.01 (−0.78, 0.76)	0.98
Somewhat helpful	22	(15)	−0.41 (−1.33, 0.51)	0.38
Very helpful	11	(7)	−2.15 (−3.29, −1.01)	0.0003
Not very helpful	21	(14)	0.0 (ref)	
Handouts about TV time				
Not applicable (did not receive)	43	(28)	0.21 (−0.67, 1.10)	0.63
Somewhat helpful	48	(32)	−0.19 (−1.03, 0.66)	0.66
Very helpful	40	(26)	−0.54 (−1.43, 0.35)	0.23
Not very helpful	20	(13)	0.0 (ref)	
TV tracking calendar with stickers				
Not applicable (did not receive)	44	(29)	0.52 (−0.25, 1.30)	0.19
Somewhat helpful	37	(25)	−0.30 (−1.05, 0.45)	0.43
Very helpful	37	(25)	−0.52 (−1.28, 0.24)	0.18
Not very helpful	33	(22)	0.0 (ref)	
Berenstain Bears' 'Too Much TV' children's book				
Not applicable (did not receive)	55	(36)	−0.27 (−1.22, 0.68)	0.58
Somewhat helpful	36	(24)	−0.26 (−1.23, 0.71)	0.60
Very helpful	45	(30)	−1.31 (−2.26, −0.35)	0.01
Not very helpful	15	(10)	0.0 (ref)	

P-values account for clustering using PROC GLIMMIX.

[a]Adjusted for child age, sex, and race/ethnicity; parent education and overweight/obesity status at baseline; household income; and exact time elapsed from baseline to follow-up visit.