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Two-year follow-up of a primary care-based intervention to prevent and manage childhood obesity: the High Five for Kids study

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Summary

Background: The obesity epidemic has spared no age group, even young infants. Most childhood obesity is incident by the age of 5 years, making prevention in preschool years a priority.

Objective: To examine 2-year changes in age- and sex-specific BMI *z*-scores and obesity-related behaviours among 441 of the 475 originally recruited participants in High Five for Kids, a cluster randomized controlled trial in 10 paediatric practices.

Methods: The intervention included a more intensive 1-year intervention period (four in-person visits and two phone calls) followed by a less intensive 1-year maintenance period (two in-person visits) among children who were overweight or obese and age 2–6 years at enrolment. The five intervention practices restructured care to manage these children including motivational interviewing and educational modules targeting television viewing and intakes of fast food and sugar-sweetened beverages.

Results: After 2 years, compared with usual care, intervention participants had similar changes in BMI *z*-scores (−0.04 units; 95% CI −0.14, 0.06), television viewing (−0.20 h/d; −0.49 to 0.09) and intakes of fast food (−0.09 servings/week; −0.34 to 0.17) and sugar-sweetened beverages (−0.26 servings/day; −0.67 to 0.14).

Conclusion: High Five for Kids, a primarily clinical-based intervention, did not affect BMI *z*-scores or obesity-related behaviours after 2 years.

Keywords: Behaviours, childhood, intervention, obesity.

Background

In the USA in 2011–2012, approximately 14.4% of children age 2–5 years were overweight (age- and sex-specific BMI in the 85th to <95th percentile) and 8.4% were obese (BMI ≥95th percentile) (1). Most childhood obesity is incident by the age of 5 years (2), making prevention in the preschool years a priority.

Obesity prevention interventions in primary care settings targeting preschool-age children may be beneficial because children of this age visit their primary care clinicians frequently for routine medical care; parents have more control over their children's health-related behaviours, and these behaviours may be more malleable.

High Five for Kids was a primary care-based obesity intervention among children age 2–6 years. The intervention consisted of a more intensive 1-year intervention period followed by a less intensive 1-year maintenance period. After 1 year, we reported that the intervention did not reduce BMI *z*-scores (−0.05 units; 95% CI −0.14, 0.04) or intakes of fast food and sugar-sweetened beverages but was effective in reducing television viewing (−0.36 h/d; 95% CI, −0.64 to −0.09) (3). The purpose of this study was to assess the effectiveness of the intervention after the planned 2-year intervention period.

Table 1 Baseline characteristics and behaviours of participants in the High Five for Kids study overall and by intervention assignment

	Overall	Intervention	Usual care
	$n = 445$	$n = 253$	$n = 192$
		Mean (SD) or *n* (%)	
Child characteristics			
Age, year	4.9 (1.2)	4.8 (1.2)	5.2 (1.1)
Sex, %			
Female	215 (48.3)	121 (47.8)	94 (49.0)
Male	230 (51.7)	132 (52.2)	98 (51.0)
Race/ethnicity, %			
White	252 (56.6)	118 (46.6)	134 (69.8)
Black	84 (18.9)	70 (27.7)	14 (7.3)
Latino	74 (16.6)	48 (19.0)	26 (13.5)
Other	35 (7.9)	17 (6.7)	18 (9.4)
BMI, $kg\,m^{-2}$	19.2 (2.3)	19.2 (2.6)	19.1 (2.0)
BMI *z*-score	1.85 (0.63)	1.88 (0.69)	1.82 (0.56)
BMI category, %			
85th to <95th percentile	195 (43.8)	118 (46.6)	77 (40.1)
≥95th percentile	250 (56.2)	135 (53.4)	115 (59.9)
Time elapsed from baseline to 2-year follow-up, months	26.1 (2.3)	26.3 (2.4)	25.9 (2.1)
Child health behaviours			
Sugar-sweetened beverage intake, servings/day	2.1 (1.7)	2.3 (1.8)	2.0 (1.5)
Fast food consumption, servings/week	1.1 (0.9)	1.2 (0.9)	1.1 (0.9)
Total TV and video viewing, h/d	2.6 (1.5)	2.7 (1.6)	2.4 (1.3)
Parent and household characteristics			
Parent overweight/obesity status, %			
Normal weight (BMI <25)	17 (3.8)	8 (3.2)	9 (4.7)
Overweight (BMI 25 to <30)	189 (42.6)	90 (35.7)	99 (51.6)
Obese (BMI ≥30)	238 (53.6)	154 (61.1)	84 (43.8)
Parent education, %			
Some college or below	171 (38.4)	106 (41.9)	65 (33.9)
College graduate	274 (61.6)	147 (58.1)	127 (66.1)
Annual household Income, %			
<$50 000	126 (28.7)	88 (35.5)	38 (19.9)
≥$50 000	313 (71.3)	160 (64.5)	153 (80.1)
Marital status, %			
Not married	107 (24.0)	66 (26.1)	41 (21.4)
Married	338 (76.0)	187 (73.9)	151 (78.6)

Methods

High Five for Kids was a cluster randomized controlled trial to reduce obesity in 10 paediatric practices (five intervention, five usual care) of Harvard Vanguard Medical Associates, a multisite group practice in Massachusetts (3). We enrolled 271 intervention and 204 usual care children age 2–6 years with BMI ≥95th percentile or 85th to <95th percentile if at least one parent was overweight (BMI ≥25 $kg\,m^{-2}$); 253 intervention and 192 usual care children had 1-year outcomes; 249 intervention (93% of those enrolled) and 192 usual care (93% of those enrolled) children had 2-year outcomes. The overarching model for this intervention was the Chronic Care Model (4), which posits that changes in primary care to produce functional patient outcomes require changes for all members of the practice team. Intervention practices received primary care restructuring, and families received motivational interviewing by

Table 2 Change in BMI and health behaviours from baseline to 2 years by intervention assignment

	Baseline	2 Years	Change	Unadjusted difference[1]	Adjusted difference[2]
	Mean (SD)			β (95% CI)	
BMI *z*-score					
Intervention	1.88 (0.69)	1.67 (0.67)	−0.20 (0.51)	−0.02 (−0.12, 0.07)	−0.04 (−0.14, 0.06)
Usual care	1.82 (0.56)	1.65 (0.60)	−0.18 (0.47)		
BMI					
Intervention	19.2 (2.6)	20.3 (3.6)	1.11 (1.99)	−0.07 (−0.57, 0.43)	−0.08 (−0.53, 0.36)
Usual care	19.1 (2.0)	20.4 (2.9)	1.22 (1.82)		
Sugar-sweetened beverage intake, servings/day					
Intervention	2.25 (1.77)	1.62 (1.38)	−0.61 (1.71)	−0.26 (−0.64, 0.12)	−0.26 (−0.67, 0.14)
Usual care	1.95 (1.54)	1.65 (1.28)	−0.31 (1.22)		
Fast food consumption, servings/week					
Intervention	1.16 (0.93)	0.94 (0.72)	−0.23 (0.90)	−0.13 (−0.37, 0.12)	−0.09 (−0.34, 0.17)
Usual care	1.13 (0.90)	1.05 (0.83)	−0.08 (0.97)		
Total TV and video viewing, h/d					
Intervention	2.67 (1.58)	2.17 (1.14)	−0.50 (1.54)	−0.27 (−0.54, 0.00)	−0.20 (−0.49, 0.09)
Usual care	2.44 (1.33)	2.21 (1.16)	−0.23 (1.22)		

[1]Corrected for clustering within practice.
[2]Adjusted for child age, sex and race/ethnicity; parent education and overweight/obesity status at baseline; household income and time elapsed from baseline to 2-year follow-up visit.

clinicians and educational modules targeting television viewing and intakes of fast food and sugar-sweetened beverages. During the 1-year intervention period, we aimed for participants to complete four in-person visits and two phone calls with clinicians. During the subsequent 1-year maintenance period, we aimed for participants to complete two in-person intervention visits. Details of the recruitment, randomization and the intervention through 1 year have been described elsewhere (3). The institutional review board of Harvard Pilgrim Health Care approved all study procedures.

Our primary outcome was change in BMI *z*-scores from baseline to 2 years. During routine clinical visits, medical assistants measured children's weight and height, and we calculated age- and sex-specific BMI *z*-scores using US national reference data (5). Secondary outcomes were changes in duration of television viewing and intakes of fast food and sugar-sweetened beverages from baseline to 2 years. We used validated questions to assess duration of television viewing and intakes of fast food and sugar-sweetened beverages (6–8). We first examined baseline distributions of child and parent characteristics by intervention status. In intent-to-treat analyses, we used unadjusted and multivariable-adjusted linear regression models to estimate differences from baseline to 2 years between the intervention and usual care groups. We adjusted for child age, sex and race/ethnicity; parent education and overweight/obesity status at baseline; household income and time elapsed from baseline to follow-up visit. In all models, we performed generalized linear mixed models that accounted for clustering by practices.

Results

At baseline, the mean (SD) age was 4.9 (1.2) years. Mean (SD) BMI was 19.2 (2.6) among intervention children and 19.1 (2.0) among usual care children, and BMI *z*-scores were 1.88 (0.69) and 1.82 (0.56), respectively. Children in intervention clinics had a higher percent of racial/ethnic minorities (53 vs. 30%), an obese parent (61 vs. 44%) and lived in lower income households (35 vs. 20% ≤$50 000/year). There were no group differences at baseline in health behaviours (Table 1). Among the 253 intervention participants, 62% of participants completed 0 visits, 17% completed one visit and 21% completed two of the two intervention visits during the 1-year maintenance period.

At 2-year follow-up, the mean (SD) age of participants was 7.0 (1.2) years. BMI had increased by a mean of 1.1 kg m^{-2} in the intervention group and 1.2 kg m^{-2} in the usual care group corresponding to decreases in BMI *z*-scores in both groups (−0.20 and −0.18, respectively). In adjusted models, compared with usual care, participants in intervention clinics had similar changes in BMI *z*-scores (−0.04 units; 95% CI −0.14, 0.06), television viewing (−0.20 h/d; 95% CI −0.49 to 0.09) and intakes of fast food (−0.09 servings/week; 95% CI −0.34 to 0.17) and sugar-sweetened beverages (−0.26 servings/day; 95% CI −0.67 to 0.14) relative to participants in usual care clinics. (Table 2) We did not observe any differences in outcomes according to subgroups defined by child age, sex or race/ethnicity, by parent education or overweight/obesity status or by household income.

Discussion

In summary, after 2 years, the High Five for Kids intervention did not appreciably improve BMI *z*-scores or obesity-related behaviours compared with children not receiving the intervention. At least two factors could have contributed to the lack of intervention effect on BMI *z*-scores. First, our intervention involved only the primary care setting and not children's communities or environment. It is possible that primary care-based interventions alone will not effect change in BMI *z*-scores but could complement and potentially enhance more comprehensive efforts in multiple settings. Second, adherence to intervention activities was low during the 1-year maintenance period. It is possible that the intervention 'dose' delivered during the 1-year maintenance period was not sufficient in effecting changes in BMI *z*-scores. However, even at 1 year, High Five for Kids did not show an effect on BMI *z*-scores (3). Obesity prevention interventions in children may require more contact hours and/or additional settings to be effective.

Conflict of Interest Statement

The authors report no conflicts of interest.

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