A Parent-Focused Intervention to Reduce Infant Obesity Risk Behaviors: A Randomized Trial

WHAT’S KNOWN ON THIS SUBJECT: While obesity-promoting eating, sedentary and physical activity behaviors, and increased prevalence of adiposity are evident from early life, few high-quality studies have evaluated interventions that seek to influence the development of these behaviors in very early childhood.

WHAT THIS STUDY ADDS: This study highlights the receptivity of first-time parents to interventions focused on their new infant’s eating and active play and provides evidence of effectiveness on some obesity-promoting behaviors in very early childhood.

abstract

OBJECTIVE: To assess the effectiveness of a parent-focused intervention on infants’ obesity-risk behaviors and BMI.

METHODS: This cluster randomized controlled trial recruited 542 parents and their infants (mean age 3.8 months at baseline) from 62 first-time parent groups. Parents were offered six 2-hour dietitian-delivered sessions over 15 months focusing on parental knowledge, skills, and social support around infant feeding, diet, physical activity, and television viewing. Control group parents received 6 newsletters on nonobesity-focused themes; all parents received usual care from child health nurses. The primary outcomes of interest were child diet (3 × 24-hour diet recalls), child physical activity (accelerometry), and child TV viewing (parent report). Secondary outcomes included BMI z-scores (measured). Data were collected when children were 4, 9, and 20 months of age.

RESULTS: Unadjusted analyses showed that, compared with controls, intervention group children consumed fewer grams of noncore drinks (mean difference = −4.45; 95% confidence interval [CI]: −7.92 to −0.99; \(P = .01\)) and were less likely to consume any noncore drinks (odds ratio = 0.48; 95% CI: 0.24 to 0.95; \(P = .034\)) midintervention (mean age 9 months). At intervention conclusion (mean age 19.8 months), intervention group children consumed fewer grams of sweet snacks (mean difference = −3.69; 95% CI: −6.41 to −0.96; \(P = .008\)) and viewed fewer daily minutes of television (mean difference = −15.97; 95% CI: −25.97 to −5.96; \(P = .002\)). There was little statistical evidence of differences in fruit, vegetable, savory snack, or water consumption or in BMI z-scores or physical activity.

CONCLUSIONS: This intervention resulted in reductions in sweet snack consumption and television viewing in 20-month-old children. Pediatrics 2013;131:652–660

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KEY WORDS RCT, obesity prevention, infant, diet, physical activity, TV viewing

ABBREVIATIONS CI—confidence interval

ICC—intraclass correlation coefficient

LGA—local government areas

MCH—Maternal and Child Health

RCT—randomized controlled trial

SEP—socioeconomic position

zBMI—BMI z-scores

(Continued on last page)
Worldwide, 43 million children aged 0 to 5 years are overweight or obese, representing a relative increase in prevalence of 60% since 1980. A recent analysis of the impact of early childhood weight on later adiposity confirms that body size in children as young as 5 to 6 months and weight gain from 0 to 2 years are consistently predictive of high subsequent body size at age 13 years. Furthermore, upward crossing of major weight-for-length percentiles in the first 6 months of life is associated with high obesity rates at ages 5 and 10 years. Prevention of excess weight gain in early life is clearly of paramount importance, yet the most recent Cochrane Review of childhood obesity prevention identified just 1 rigorous obesity prevention study in early childhood. Given the opportunity for early prevention, an urgent need exists for studies demonstrating the potential of interventions to reduce obesity-risk behaviors.

Parents are a key influence on the development and maintenance of children’s behaviors and are a rational target for child obesity prevention. They are also an attractive target given their focus on child health. In Victoria, Australia, parents access health services an average of 35 times in the first year of their child’s life, primarily to seek advice on promoting health and wellness. The free, universal service provided by Maternal and Child Health (MCH) nurses engages ∼66% of all first-time parents in groups that run over a 6- to 8-week period in the first 3 months of a child’s life. Most of these MCH nurse-initiated groups subsequently become independent social groups that continue to meet (fortnightly on average) for ∼18 months. These preexisting social groups provide an opportunity for the promotion of knowledge, skills, and strategies likely to promote healthy child behaviors and present an ideal setting for obesity prevention interventions.

In this cluster randomized controlled trial (RCT), we tested the hypotheses that an obesity prevention intervention delivered to first-time parents in preexisting social groups would improve aspects of child diet, increase child time spent physically active, and reduce child television viewing time. We also hypothesized that child BMI z-score would be lower in the intervention group children. This study is reported by using the framework of the CONSORT statement for parallel group randomized trials.

METHODS
Study Design
This study was a cluster RCT with balanced (1:1) randomization. Fourteen local government areas (LGAs) were randomly selected from the 28 eligible LGAs located within a 60-km radius of the research center, situated within the major metropolitan city of Melbourne, Australia (population 4 million). One eligible LGA declined to participate and was replaced with the next LGA on the randomly ordered list. Good representation of LGAs across socioeconomic areas of low SEP are less likely to attend first-time parent groups. When first-time parents’ groups declined to participate, another randomly selected group was approached.

Randomization of first-time parents’ groups (clusters) occurred after recruitment to avoid selection bias. Randomization (stratified by LGA) was conducted by an independent statistician. Although parents were not blinded to allocation, they were not informed of the study aims or hypotheses. Staff measuring height and weight were not blinded to intervention status because they also delivered the intervention. All dietary recalls, data entry, and analyses were conducted with staff blinded to participant’s group allocation.

Intervention
Intervention Arm
Intervention delivery occurred from June 2008 to February 2010 with individual groups involved for 15 months. The dietitian-delivered intervention comprised six 2-hour sessions delivered quarterly during the first-time parents’ group regular meeting. Data collection occurred at child age 4 months (baseline) and when children were 9 months of age (midintervention) and 20 months of age (postintervention). If parents did not attend these sessions, data collection occurred in the home. Program (intervention) materials were sent to nonattending parents, and a researcher telephoned to invite questions. Program fidelity was audited via checklists by researchers attending but not delivering the intervention.

The intervention is described in detail elsewhere. In summary, it sought to build knowledge, skills, and social support regarding infant feeding, physical activity, and sedentary behaviors. Messages were anticipatory in nature, such that concepts were...
presented before the associated child developmental phase. Social cognitive theory\textsuperscript{14} guided program development, incorporating a range of delivery modes and educational strategies including group discussion and peer support, as well as exploration of facilitators and barriers to uptake of key messages. Intervention materials incorporated 6 purpose-designed key messages (for example, “Color Every Meal With Fruit and Veg,” “Eat Together, Play Together,” “Off and Running”) within a purpose-designed DVD and written materials. A newsletter reinforcing key messages was sent to participants between sessions.

**Control Group**

Control parents received usual care from their MCH nurse, who may have provided lifestyle advice. The provision of this information was not assessed. Researchers met with control families in their first-time parent groups at the 3 data collection occasions. For those no longer attending groups, data collection occurred in the home. Control families received 6 newsletters regarding unrelated aspects of child health or development (eg, literacy, common illnesses). Intervention and control group families’ participation was acknowledged by small gifts (maximum value AUD$15.00) on receipt of completed questionnaires.

**Measures**

**24-Hour Dietary Recall**

Child’s dietary intake (3 days, including 1 weekend day) was assessed by trained nutritionists at mid- and postintervention data collections by telephone-administered multipass 24-hour recall with parents.\textsuperscript{15} To limit bias of responses, calls were unscheduled when possible (98\% of all calls). When necessary (4\% of recalls), food diaries were completed by other carers during child-care periods on scheduled days. These were then used by parents to provide detailed 24-hour recalls. Coding of the dietary data involved matching each food/beverage item to an appropriate nutrient composition and quantity, using the 2007 Australian Food and Nutrient Database (AUSNUT) Database.\textsuperscript{16} Data were checked for accuracy by dietitian review of interviews following coding.

Participants with <2 days of dietary recall were excluded from analyses ($n = 53$ midintervention; $n = 82$ postintervention). Average daily intakes of fruits (excluding juice), vegetables (excluding potatoes), noncore sweet foods (eg, chocolate, candy, cakes), noncore savory foods (eg, crisps, savory biscuits), noncore drinks (ie, fruit juice, soft drinks), and water were calculated.

**Objectively Assessed Physical Activity**

Physical activity was assessed by using ActiGraph accelerometers (Model GT1M, Pensacola, FL) postintervention.\textsuperscript{17} Children wore the accelerometer over the right hip for 8 days, removing only for sleeping and bathing. Those with $\geq 4$ days of valid data were included in analyses ($n = 286$) as 4 days of data ($\geq 7.4$ hours per day) in this sample provided an acceptable reliability estimate (intra-class correlation coefficient [ICC] >0.70) for light- to vigorous-intensity physical activity.\textsuperscript{18} Light-, moderate-, and vigorous-intensity physical activity was examined together as the intervention promoted participation in physical activity of any intensity.

**Television Viewing Time**

At each time point, parents completed a questionnaire assessing infant time spent watching television on a typical day. A 2-week test-retest assessment of question reliability in a separate (unrelated) sample of 60 mothers of 9-month-old infants and 51 mothers of 18-month-old infants showed good reliability (ICC = 0.86, 95\% confidence interval [CI] 0.77 to 0.91 and ICC = 0.84, 95\% CI 0.72 to 0.90, respectively).

**BMI**

Children’s height/length and weight without clothes were measured by trained staff at each time point. Height/length was measured to 0.1 cm using a calibrated measuring mat (Seca 210, Seca Deutschland, Germany) or portable stadiometer (Invicta 1582, Tokyo, Japan). Weight was measured to 10 g using calibrated infant digital scales (Tanita, Tokyo, Japan). The average of 2 measures was used in analyses. BMI (kg/m$^2$) and BMI z-scores (zBMI) were calculated by using World Health Organization gender-specific BMI-for-age growth charts.\textsuperscript{19}

**Process Evaluation**

Process evaluation was undertaken at each session and sought participants’ feedback on the usefulness and relevance of the program (ie, “How useful was the session overall?” and “How relevant was this session to you and your family?”). Respondents were asked to rate on a 4-point scale from “not at all useful/relevant” to “very useful/relevant.”

**Economic Analysis**

Resources used for dietitian training, coordination, and session delivery were recorded prospectively via time-use logs kept by the research team. Resources were valued in 2010 Australian dollars by using existing national estimates for labor time and travel and market prices for venue and materials.

**Sample Size and Power**

Sample size was based on those outcomes for which data on the mean and SD in 18-month-old Australian children were available (sweetened drinks, potato crisps, confectionary, cake, fruit, and vegetables).\textsuperscript{20} The sample required to detect a 25\% increase in vegetable
Statistical Analysis

All analyses were conducted on an intention-to-treat basis with participants analyzed according to the trial arm to which they were randomized where they provided outcome data (ie, analysis of completers). Physical activity was assessed at postintervention only, and wear-time was adjusted for in analyses.

Random effects linear regression models, estimated using maximum likelihood, were fitted to compare continuous outcomes between the trial arms, specifying parent groups as random effects to take account of clustering. Because some of the outcomes were highly skewed, the nonparametric bootstrap method22 was used to validate the CIs, based on 2000 resamples, for all linear regression models. Because the CIs were virtually the same, we report the model-based confidence intervals and $P$ values. For those outcomes in which a large proportion of children (particularly in the mid-intervention data) had scores of zero due to their young age (noncore drinks, sweet snacks, savory snacks, and TV viewing), additional analyses were conducted to assess the effect of the intervention on the odds of consuming/viewing any compared with none. Marginal logistic regression models, estimated using generalized estimating equations with information sandwich (“robust”) standard errors, were fitted to compare these binary outcomes between the trial arms, taking account of clustering. An exchangeable correlation structure was specified for these analyses. Because baseline child BMI data were available, models of the zBMI outcome adjusted for the baseline values. Additional multivariable models were fitted controlling for known predictors of the outcomes studied (ie, mothers’ education level [in all models]; mothers’ prepregnancy BMI [for zBMI outcomes]; child age [for TV viewing or physical activity outcomes]; child gender [for physical activity outcome]; and child energy intake [for dietary outcomes]). Analyses were conducted by using Stata software (Release 12; StataCorp LP, College Station, TX).

RESULTS

Participant recruitment and retention are detailed in Fig 1. Final recruitment of 62 parent group clusters resulted in a sample of 542 children. Although Table 1 shows no marked differences in baseline characteristics between trial arms, participating parents excluded from midintervention analyses due to missing data and loss to follow-up were more likely at baseline to have low levels of maternal education (57.5% vs 36.1%). There were no marked differences between parents excluded from postintervention analyses and those not excluded. There was also no difference in the proportions of intervention and control group participants excluded from analysis at either time point.

Table 2 shows that, at midintervention assessment (parents having attended 2 of the 6 sessions; child mean age 9 months [SD 1.1]), intervention group children had lower noncore-drink intake than control group children. This difference remained when results were adjusted for prognostic factors. Intervention group children also had lower sweet snack intakes in the adjusted analyses.

Differences in outcomes between the intervention and control arms at study completion (mean child age 19.8 months [SD 2.7]) are also presented in Table 2. Intervention group children had lower intake of sweet snacks and lower television viewing time compared with those in the control group. These differences remained after adjustment. Table 3 shows the effects of the intervention on the odds that children consumed any noncore food/drinks and watched any television. Intervention group children had reduced odds of consuming noncore drinks midintervention, and this association remained when adjusting for covariates. No other intervention effects were found for children’s likelihood of consuming noncore food/drinks or viewing television at either time point.

Of those participants in the intervention arm who completed the trial, 68% attended the majority of intervention sessions (≥4 of 6 sessions), whereas just 9% attended <2 sessions. Mothers
consistently reported high levels of program usefulness and relevance (Table 4).

The total estimated cost of delivering the program, based on the costs of the intervention adjusted for the fact that a trial setting sees an artificially small number of families included relative to the workforce employed, was approximately AUD $500 per family.

TABLE 1 Baseline (T1) Characteristics of 542 First-Time Mothers and Infants According to Treatment Arm

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Control</th>
<th>Intervention</th>
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<tbody>
<tr>
<td><strong>Children</strong></td>
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<tr>
<td>Age at baseline (mo), mean (SD)</td>
<td>3.9 (1.6)</td>
<td>3.9 (1.6)</td>
<td>3.9 (1.6)</td>
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<tr>
<td>Male (%)</td>
<td>52.6</td>
<td>53.5</td>
<td>51.7</td>
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<tr>
<td>zBMI, mean (SD)</td>
<td>-0.5 (1.0)</td>
<td>-0.5 (1.0)</td>
<td>-0.4 (1.1)</td>
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<tr>
<td>Ever breastfed (%)</td>
<td>96.6</td>
<td>96.6</td>
<td>96.6</td>
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<tr>
<td><strong>Mothers</strong></td>
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<td>Age at baseline (y), mean (SD)</td>
<td>32.3 (4.3)</td>
<td>32.1 (4.4)</td>
<td>32.5 (4.2)</td>
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<tr>
<td>BMI before pregnancy, mean (SD)</td>
<td>24.5 (5.2)</td>
<td>24.3 (4.9)</td>
<td>24.8 (5.6)</td>
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<td>Education level, %</td>
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<tr>
<td>Low (completed up to final year of secondary school)</td>
<td>21.1</td>
<td>20.3</td>
<td>22.0</td>
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<tr>
<td>Intermediate (completed trade/certificate postsecondary school)</td>
<td>24.7</td>
<td>22.9</td>
<td>26.5</td>
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<tr>
<td>High (completed university degree or beyond)</td>
<td>54.2</td>
<td>56.8</td>
<td>51.5</td>
</tr>
<tr>
<td>Born in Australia (%)</td>
<td>79.1</td>
<td>79.7</td>
<td>78.4</td>
</tr>
<tr>
<td>English is main language spoken at home (%)</td>
<td>93.8</td>
<td>93.6</td>
<td>93.9</td>
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</table>

T1, baseline data.
### TABLE 2 Distribution of the Outcomes and Assessment of the Effects of the Intervention on These Outcomes at Mid- (T2) and Postintervention (T3)

<table>
<thead>
<tr>
<th></th>
<th>Control Mean (SD)</th>
<th>Control Median (IQR)</th>
<th>Intervention Mean (SD)</th>
<th>Intervention Median (IQR)</th>
<th>Mean Difference (95% CI)</th>
<th>Mean Difference (95% CI)</th>
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<tr>
<td>Midintervention (mean child age 9 [1.1] mo)</td>
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<tr>
<td>zBMI</td>
<td>0.2 (1.0)</td>
<td>0.2 (−0.5 to 0.8)</td>
<td>0.2 (1.0)</td>
<td>0.2 (−0.5 to 0.8)</td>
<td>−0.01 (−0.13 to 0.11)</td>
<td>−0.01 (−0.14 to 0.11)</td>
</tr>
<tr>
<td>Fruit intake (g/d)</td>
<td>101.0 (71.4)</td>
<td>86.0 (46.7 to 141.4)</td>
<td>107.2 (72.5)</td>
<td>98.3 (53.2 to 139.2)</td>
<td>7.80 (−6.26 to 21.86)</td>
<td>7.02 (−5.46 to 19.49)</td>
</tr>
<tr>
<td>Vegetable intake (g/d)</td>
<td>103.5 (73.7)</td>
<td>78.9 (54.5 to 131.2)</td>
<td>107.8 (77.9)</td>
<td>94.2 (50.8 to 141.1)</td>
<td>4.27 (−7.93 to 16.47)</td>
<td>3.08 (−8.21 to 14.36)</td>
</tr>
<tr>
<td>Water intake (g/d)</td>
<td>112.2 (89.7)</td>
<td>92.5 (43.3 to 182.6)</td>
<td>108.2 (80.7)</td>
<td>84.2 (41.0 to 144.0)</td>
<td>−3.72 (−18.52 to 11.07)</td>
<td>−4.57 (−18.57 to 9.83)</td>
</tr>
<tr>
<td>Noncore drink intake (g/d)</td>
<td>6.6 (26.8)</td>
<td>0.0 (0.0 to 0.0)</td>
<td>2.1 (13.2)</td>
<td>0.0 (0.0 to 0.0)</td>
<td>−4.55 (−7.92 to −0.99)</td>
<td>−4.57 (−8.00 to −1.14)</td>
</tr>
<tr>
<td>Sweet snack intake (g/d)</td>
<td>2.1 (5.8)</td>
<td>0.0 (0.0 to 1.3)</td>
<td>1.5 (3.7)</td>
<td>0.0 (0.0 to 0.0)</td>
<td>−0.82 (−1.77 to 0.03)</td>
<td>−0.97 (−1.91 to 0.04)</td>
</tr>
<tr>
<td>Savory snack intake (g/d)</td>
<td>0.7 (2.2)</td>
<td>0.0 (0.0 to 0.0)</td>
<td>0.7 (2.3)</td>
<td>0.0 (0.0 to 0.0)</td>
<td>−0.05 (−0.41 to 0.31)</td>
<td>−0.09 (−0.44 to 0.27)</td>
</tr>
<tr>
<td>Television viewing (min/d)</td>
<td>36.6 (50.7)</td>
<td>19.3 (0.0 to 60.0)</td>
<td>35.5 (68.3)</td>
<td>10.0 (0.0 to 42.9)</td>
<td>−1.08 (−10.46 to 8.45)</td>
<td>−1.64 (−10.70 to 7.45)</td>
</tr>
<tr>
<td>Postintervention (mean child age 19.8 [2.2] mo)</td>
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</tr>
<tr>
<td>zBMI</td>
<td>0.8 (1.9)</td>
<td>0.8 (0.1 to 1.3)</td>
<td>0.8 (0.9)</td>
<td>0.9 (0.3 to 1.5)</td>
<td>−0.01 (−0.18 to 0.17)</td>
<td>−0.02 (−0.18 to 0.14)</td>
</tr>
<tr>
<td>Fruit intake (g/d)</td>
<td>132.9 (81.5)</td>
<td>147.9 (87.7 to 210.1)</td>
<td>161.2 (19.1)</td>
<td>145.7 (89.2 to 212.0)</td>
<td>10.98 (6.69 to 28.06)</td>
<td>15.33 (2.59 to 29.25)</td>
</tr>
<tr>
<td>Vegetable intake (g/d)</td>
<td>80.8 (57.8)</td>
<td>89.3 (57.9 to 105.7)</td>
<td>85.3 (53.0)</td>
<td>75.8 (48.6 to 106.9)</td>
<td>4.53 (−2.99 to 13.25)</td>
<td>6.62 (−2.51 to 15.76)</td>
</tr>
<tr>
<td>Water intake (g/d)</td>
<td>597.7 (212.1)</td>
<td>273.5 (193.3 to 433.5)</td>
<td>592.9 (218.9)</td>
<td>316.7 (200.0 to 500.0)</td>
<td>24.17 (−9.85 to 58.20)</td>
<td>30.28 (−3.30 to 63.87)</td>
</tr>
<tr>
<td>Noncore drink intake (g/d)</td>
<td>25.4 (67.5)</td>
<td>0.0 (0.0 to 6.0)</td>
<td>23.7 (58.8)</td>
<td>0.0 (0.0 to 0.0)</td>
<td>−2.21 (−13.71 to 9.30)</td>
<td>−5.56 (−17.48 to 6.36)</td>
</tr>
<tr>
<td>Sweet snack intake (g/d)</td>
<td>14.7 (15.7)</td>
<td>11.4 (11.1 to 21.3)</td>
<td>11.0 (14.1)</td>
<td>6.2 (0.0 to 15.3)</td>
<td>−5.89 (−6.41 to −0.96)</td>
<td>−3.60 (−6.34 to 0.86)</td>
</tr>
<tr>
<td>Savory snack intake (g/d)</td>
<td>5.8 (10.4)</td>
<td>0.0 (0.0 to 0.0)</td>
<td>4.8 (7.9)</td>
<td>1.8 (0.0 to 6.0)</td>
<td>−1.01 (−2.82 to 0.80)</td>
<td>−1.00 (−2.82 to 0.79)</td>
</tr>
<tr>
<td>Television viewing (min/d)</td>
<td>60.6 (66.9)</td>
<td>30.0 (15.0 to 71.3)</td>
<td>45.5 (48.9)</td>
<td>30.0 (15.0 to 60.0)</td>
<td>−15.97 (−25.97 to −5.98)</td>
<td>−17.12 (−26.45 to −7.79)</td>
</tr>
<tr>
<td>Physical activity (min/d)</td>
<td>236.8 (33.8)</td>
<td>237.6 (209.0 to 252.5)</td>
<td>228.3 (42.3)</td>
<td>224.1 (198.3 to 254.3)</td>
<td>−2.94 (−11.44 to 5.55)</td>
<td>−2.03 (−9.75 to 5.70)</td>
</tr>
</tbody>
</table>

**Mean difference coefficients estimated from linear regression analysis. IQR, interquartile range; T2, mid-intervention; T3, post-intervention.**

*Random effects linear regression models, estimated using maximum likelihood with bootstrapped standard errors, were fitted to compare continuous outcomes between the trial arms, taking account of clustering. The model that assessed the effect of the intervention on BMI adjusted for baseline BMI. The model that assessed the effect of the intervention on physical activity (20 month only) adjusted for accelerometer wear time because this differed significantly between groups.

**Random effects models, estimated using maximum likelihood with bootstrapped standard errors, were fitted to compare continuous outcomes between the trial arms, taking account of clustering.** The BMI model adjusted for baseline BMI, mothers’ education level, and mothers’ prepregnancy BMI. The dietary intake models adjusted for mothers’ education level and children’s overall energy intake. The television-viewing model adjusted for mothers’ education level and child’s age. The physical activity model (20 month only) adjusted for accelerometer wear time, maternal education, and child’s age.

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The intervention was well received, with families reporting it as enjoyable and beneficial. Children showed increased physical activity and decreased sedentary behaviors, consistent with previous reports. However, differences in behavior were not sustained over time, possibly due to the short duration of the intervention. Further research is needed to evaluate the long-term effects of such interventions.
first-time mothers of infants before weaning and adds important support to a growing body of evidence endorsing a focus on early childhood. This focus for obesity prevention has gained considerable currency since this study commenced, with 1 published protocol,28 2 pilot studies,29,30 and 1 additional RCT published.31 Data from the pilots and RCTs, targeting mothers and infants <6 months of age, provide additional support for a focus on early childhood with 1 nonrandomized trial (n = 80) reporting a trend to reductions in television viewing29 and another (n = 110) reporting a lower weight-for-length percentile in intervention children (P = .009).29 Wen’s RCT intensive home visiting intervention31 targeting families living in socially and economically disadvantaged areas of Sydney, Australia (n = 667), reports lower BMI and improvements in some obesity-promoting behaviors at age 2 years in the intervention compared with the control group. The previously mentioned RCT in a Cochrane review4 (n = 43) reported evidence of lower child energy intake in the intervention group (P = .06) but no differences in BMI.5

Generalizability and Implications

The high levels of participation observed in this trial, in terms of recruitment, retention, and program attendance, likely reflect parents’ receptivity and desire to learn at this time in child’s development. This is also reflected in positive ratings of program usefulness and relevance.

The public health utility of this intervention is important to acknowledge. This was a low-dose, low-cost intervention that could feasibly be translated to real-world settings. The economic cost of the delivery of programs needs to be considered in terms of the overall impact of interventions. In this intervention, we have also demonstrated improvements in intervention group mothers’ dietary patterns32 and improvements in parental knowledge and attitudes regarding television viewing, active play, and diet.33 The utility of the program is based on the impact on the family as a whole and over time. The “ripple” effects of this intervention on other family members and over time will be the subject of future studies.
Strengths and Limitations

Study strengths are the RCT design and use of gold standard measures for diet and physical activity, but it is important to acknowledge that intervention-arm parents may have been more likely to provide socially desirable responses when recalling diet (and television viewing), although one might expect such error to occur for all self-reported outcomes. Women from all socioecononomic strata were recruited; however, high SEP women (as assessed by education) were overrepresented. Low SEP women were no more likely to drop out of the study yet were more likely to have missing data at midintervention, but not postintervention. This may have implications for generalizability of midintervention findings.

The analysis of data across early childhood is challenging because measures of our primary outcomes are not meaningful at baseline; for example, at 3 months of age, our cohort consumes only breast or formula milk and is not yet physically active. This may be considered as a limitation in our analyses. It reflects, however, the fact that our cohort is almost identical on measures of diet and activity at baseline (having a baseline of zero).

CONCLUSIONS

A low-dose intervention targeting first-time parents in preexisting social groups resulted in reductions in 9-month-old children's noncore drink consumption and 20-month-old children's sweet snack consumption and television viewing time. It is important to assess whether these effects are lost, maintained, or magnified over time.

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REFERENCES


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Dr Campbell (lead chief investigator) conceptualized, designed, and managed all aspects of the study and analyses; wrote the initial manuscript; and revised the final manuscript. Dr Loret undertook and managed the majority of data analyses. Dr McNaughton (associate investigator) designed and managed all dietary data collection and analyses. Dr Crawford (chief investigator) was involved in the conceptualization, design, and management of all aspects of the study and analyses. Dr Salmon (chief investigator) was involved in the conceptualization, design, and management of all aspects of the study and analyses. Dr Ball (chief investigator) was involved in the conceptualization, design, and management of all aspects of the study and analyses. Dr McCallum (chief investigator) was involved in the conceptualization, design, and management of all aspects of the study and analyses. Dr Cameron provided expert input to data analyses. Ms Hnatiuk (PhD student) undertook the bootstrapping analyses for this manuscript and provided substantive input into manuscript writing. Dr Hesketh (lead chief investigator 2) conceptualized, designed, and managed all aspects of the study and analyses. All authors critically reviewed the manuscript and approved the final manuscript as submitted.

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Ethical approval for this study was obtained from the Deakin University Human Research Ethics Committee (ID number: EC 175-2007) and by the Victorian Office for Children (Ref: CDF/07/1153).

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A Parent-Focused Intervention to Reduce Infant Obesity Risk Behaviors: A Randomized Trial


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