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RESEARCH ARTICLE

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Parent-directed intervention in promoting knowledge of pediatric nutrition and healthy lifestyle among low-SES families with toddlers: A randomized controlled trial

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Abstract

Objective: The objective of this study is to determine the efficacy of an interactive, home visiting curriculum tailored to low socio-economic status families in improving parental knowledge of paediatric nutrition and healthy lifestyle.

Methods: Parents of toddlers aged 13–16 months living with a household income below 200% of the federal poverty line were randomized into healthy lifestyle intervention and control home visiting curriculum groups. Each curriculum consisted of 12 one-on-one educational sessions with parents facilitated by a trained home-visitor that were administered over a 6-month intervention period. Knowledge assessments were administered before and after the intervention period.

Results: Results of a one-way analysis of covariance (ANCOVA) analysis showed that parents in the intervention group (M = 26.05, SD = 4.24) scored significantly higher than control parents (M = 23.84, SD = 4.26) post-intervention, controlling for parent education level, $F(1, 102) = 7.494$ (95% confidence interval [−3.68, −0.59]). One-way ANCOVA analysis showed no significant mean difference between the parents in the intervention group (M = 24.13, SD = 4.37) and the control group (M = 23.93, SD = 4.16) at baseline, controlling for parent education level, $F(1, 163) = 0.002$ (95% confidence interval [−1.28, 1.22]).

Conclusions: An interactive healthy lifestyle intervention focused on low-SES families significantly improved parental knowledge of paediatric healthy lifestyle. Changes in parental knowledge is a key preliminary step in behaviour change to ultimately affect behaviour. Informing and encouraging parents of toddlers to guide healthy lifestyle development early remains a promising point of intervention for prevention, rather than remediation, of childhood obesity.

KEYWORDS

child development, child public health, obesity

1 | INTRODUCTION

Childhood obesity remains a serious public health issue in the United States that develops early in life, with 7.0% of infants and toddlers ages 6–23 months having high weight-for-length based on Center for Disease Control growth charts (Akinbami, Kit, Carroll, Fakhouri, & Ogden, 2017). Infants and toddlers from low-income families have a higher prevalence of high weight-for-length than their higher income

counterparts (Freedman et al., 2017). High weight-for-length in infancy has been linked to an increased risk of obesity in adulthood (Baird et al., 2005). Consequently, weight disparities during childhood persist into adulthood, leading to increased risk of developing diabetes, hypertension, and heart disease among low-SES populations (Paeratakul, Lovejoy, Ryan, & Bray, 2002).

Weight disparities can be attributed to a multitude of factors affecting dietary and lifestyle choices. Low-SES populations encounter particular barriers to healthy eating, with inequalities including high cost of healthy eating, lack of time due to work commitments, and influence of family and friends (Inglis, Ball, & Crawford, 2005). Food shopping habits also differ between low-SES populations and higher-SES populations, as transportation and store accessibility affect shopping frequency (Wiig & Smith, 2009). Low-income families more frequently shop at convenience stores and mid-sized grocery stores, rather than supermarkets (Shannon, 2014). In analysing promoters and barriers to healthy lifestyles among low-income, urban populations, cost and finances were identified as barriers to healthy food consumption, whereas convenience and availability promoted fast food consumption (Lucan, Barg, & Long, 2010). These factors may contribute to consumption of an overall poorer quality diet; research shows low-SES populations consume more refined grains and added fats and consume less lean protein, low-fat dairy products, fresh vegetables, and fruit than higher SES populations (Darmon & Drewnowski, 2008). Additionally, low-SES children are less physically active than high-SES children (Humbert et al., 2006). Neighbourhood safety, proximity to facilities, and cost of facilities limit physical activity among low-SES children (Humbert et al., 2006; Molnar, Gortmaker, Bull, & Buka, 2004). Nutrition education is particularly important among the low-SES population, as studies have shown that low-SES parents have demonstrated significantly lower levels of nutritional knowledge than more affluent parents (Morton & Guthrie, 1997; Parmenter, Waller, & Wardle, 2000). Understanding of health impacts can be key to shifting behaviour, as health concerns were identified as a key promoter of fruit and vegetable consumption among low-income populations (Lucan et al., 2010).

Shifting the focus of obesity prevention interventions to early education of parents has the potential to greatly affect child dietary habits but has not been studied extensively to date in low-SES populations. The majority of childhood obesity interventions target school-aged children when unhealthy habits are already established and produce minimal effects (Stice, Shaw, & Marti, 2006). Conversely, parenting interventions as young as infancy have impacted infant dietary patterns (Hohman, Savage, Paul, & Birch, 2016). However, research regarding when or how to best target parent knowledge and behaviour is limited (Skouteris et al., 2011).

We designed an interactive healthy lifestyle development curriculum to educate parents of toddlers about child healthy nutritional and physical activity behaviours and strategies to best promote these behaviours. This curriculum is unique in its tailored approach to low-SES parents by extending beyond knowledge of the general principles of healthy eating and physical activity to also focus on knowledge of strategies to address barriers affecting this population. These topics included meal planning, grocery shopping on a budget, and increasing physical activity with limited facilities. Additionally, the curriculum emphasizes parent knowledge of child healthy habit development and their influence on this development.

Key messages

- Obesity, particularly in low-SES young children, remains a public health epidemic.
- The majority of interventions focus on school-aged children, after eating habits are already formed.
- An intervention focused on parent knowledge and promotion of paediatric nutritional needs significantly improved parental understanding of these needs.
- Improvements in knowledge is a key first step in creation of early interventions to ultimately target parental behaviour.

The curriculum is a 6-month intervention being tested in a 5-year ongoing longitudinal study. Consistent with theory of behaviour change, we expect changes in knowledge to be a key first step in behaviour change. Therefore, preliminary testing of programme efficacy and the aim of this paper is focused on changes in parent knowledge following the 6-month intervention period. We hypothesize that this curriculum will significantly increase parent knowledge about paediatric healthy eating and knowledge of healthy behavioural strategies.

2 | METHODS

2.1 | Participant recruitment

Sample size was determined by power calculations performed using estimated effect size and standard deviation from existing research on home interventions seeking to improve parent knowledge. Research assistants recruited parent–child dyads through postings at day care centres, libraries, health clinics, local stores, public transportation, and community organizations serving low-income populations around the Chicagoland area. Inclusion criteria required parents to be at least 18 years old, have a child aged 13–16 months without significant cognitive or physical impairments, and have a household income level below 200% of the federal poverty line. Parents were excluded if they had earned a graduate or professional degree, did not have legal custody of their child, did not live with their child, or did not spend at least two full days per week with their child. Written informed consent was obtained from each parent.

2.2 | Study design

A trained research assistant who was blinded to the assigned condition of the parent–child dyad collected data from each parent–child

dyad during a visit at their home at baseline, and again post-intervention. The parent also reported demographics and completed a knowledge questionnaire.

A matched-pair randomization procedure was used, following the baseline data collection, to ensure the two conditions are equivalent on child age at baseline. All parent–child dyads were paired by child age (in months). The first parent–child dyad in each age pair was randomly assigned to either the healthy lifestyle intervention condition or the language development control condition using coin flip. The second parent–child dyad in the same age pair was then assigned to the alternative condition. The project manager generated the matched-pair randomization sequence and assigned parent–child dyads to interventions. Both intervention and control curriculum started within 2 weeks following the baseline data collection. Participant recruitment began in May 2014, and the trial was ended in March 2017 after parent–child dyads had completed the 6-month curriculum and the post-intervention knowledge assessment. Participants received $125 compensation in total for their time.

2.3 | Healthy lifestyle intervention condition

Parents in the intervention condition received a 6-month computer-based curriculum designed to promote healthy eating and physical activity. This curriculum consisted of 12 modules that were implemented in sequence over 12 weekly home visits and facilitated by a trained research assistant in one-on-one educational sessions with parents. The content of all 12 modules was built upon the recommendations by the American Academy of Pediatrics Bright Futures on paediatric nutritional needs, healthy dietary behaviours, and physical activities for obesity prevention (see Table 1 for an overview of the content of each module) (Hagan, Shaw, & Duncа, 2007). In each of the 12 modules, the home visitor and the parent discussed a specific topic promoting a healthy lifestyle, reviewed certain practices and/or activities that could be easily implemented in everyday life, and collaboratively developed goals for diet and activity. Moreover, three key behavioural strategies, referred to as the "3Ms": Make, Model, and Mind, were interwoven throughout the curriculum to emphasize the importance of making healthy meals, modelling healthy behaviours, and minding healthy dietary decisions. The 3Ms were designed to provide parents with easy-to-understand and easy-to-remember strategies to reinforce important concepts.

2.4 | Language development control condition

The control group also received 12 one-on-one biweekly home visits, during which they received a child language intervention.

2.5 | Knowledge questionnaire

At baseline and post-intervention, each parent completed a 38-item questionnaire designed to assess knowledge of paediatric nutrition and physical activity needs, as well as behaviours and strategies to promote healthy habits. Questions testing knowledge of paediatric healthy nutrition included topics such as appropriate serving sizes, vitamins, and healthy and unhealthy fats. Questions testing knowledge of healthy behaviours and strategies included topics such as reading nutrition labels, grocery shopping on a budget, and incorporating physical activity into daily routine. The 38-item knowledge questionnaire had an overall Flesch Reading Ease score of 78.6 (ranging 0–100, with higher scores represent easier reading levels) and typically read at a 5.2 Flesch Kincaid Grade level (a readability test of the comprehension difficulty of a standard English passage, scored as the normative reading level for U.S. school grades) (Williamson & Martin, 2010). Cronbach's α in the current sample was .76.

TABLE 1 Twelve modules of healthy lifestyle curriculum

Modules	Description
1. Introduction	Empowering parent as role model for healthy lifestyle development
2. Mind	Reading nutrition labels and incorporating 5 food groups into diet
3. Make	Cooking fresh food at home and avoiding processed foods
4. Model	Positive food socialization behaviours while introducing new foods
5. Nutrients	Maximizing healthy and minimizing unhealthy nutrients in diet
6. Cooking on a budget	Strategies to save money while food shopping
7. Cooking quickly	Strategies to plan and prepare meals amid busy schedule
8. Eating healthy while out	Selecting healthy options from fast food and restaurant menus
9. Hidden dangers	Food preparation safety, allergies, and choking hazards
10. Beverages matter	Limiting intake of sugary drinks and drinking more water
11. Exercise	Ways to incorporate and promote physical activity with child
12. Dental health	Promoting appropriate dental health hygiene

2.6 | Data analysis

Preliminary *t* tests and χ^2 tests were first conducted to examine whether parents in the intervention and the control conditions were significantly different in terms of their demographic characteristics including parent race/ethnicity, education level, and employment status as well as their knowledge about healthy lifestyle at baseline. Moreover, one-way ANOVA and correlation analyses were conducted to examine demographic characteristics in relation to their knowledge at baseline. Two one-way ANCOVAs were conducted to compare knowledge between the two conditions (intervention vs. control) at baseline as well as post-intervention. Demographic characteristics that were significantly associated with knowledge would be examined as covariate. All analyses were performed using IBM SPSS Statistics 24.

3 | RESULTS

3.1 | Cross-sectional analyses

The demographic characteristics of parents and the control conditions and their knowledge about healthy lifestyle at baseline are shown in Table 2. One-way ANOVA showed that parent race/ethnicity and employment status were not significantly associated with their knowledge at baseline. However, correlation analyses indicated that parents who were more educated had higher levels of knowledge, $r = .32$, $p < .001$. Thus, education level was examined as a covariate in the mixed model analysis.

Results of two one-way ANCOVAs testing knowledge across condition at baseline and post-intervention, controlling for parent education level, are shown in Table 3. There was no significant mean difference found between the parents in the intervention group ($M = 24.13$, $SD = 4.37$) and the control group ($M = 23.93$, $SD = 4.16$) at baseline, controlling for parent education level, $F(1, 163) = 0.002$, (95% confidence interval [−1.28, 1.22]). However, parents in the intervention group ($M = 26.05$, $SD = 4.24$) scored significantly higher than control parents ($M = 23.84$, $SD = 4.26$) post-intervention, controlling for parent education level, $F(1, 102) = 7.494$ (95% confidence interval [−3.68, −0.59]).

TABLE 2 Baseline characteristics of the health lifestyle (intervention) and the language development (control) participants

	Control (49)	Intervention (55)
Parent characteristics		
Age (year)	28.8, 6.51	28.5, 7.75
Race and Ethnicity		
African American	40 (81.6%)	47 (85.5%)
Non-Hispanic White	2 (4.1%)	2 (3.6%)
Education level		
Some high school	5 (10.2%)	4 (7.3%)
High school graduate or GED equivalent	10 (20.4%)	14 (25.4%)
Some post-secondary courses	23 (46.9%)	22 (40.0%)
Associate's Degree	4 (8.2%)	8 (14.5%)
Bachelor's Degree	7 (14.3%)	7 (12.7%)
Married or Civil Union	8 (16.3%)	9 (16.4%)
Employed	23 (46.9%)	28 (50.9%)
WIC and/or LINK	40 (81.6%)	50 (90.9%)
Age (month)	12.0, 2.52	11.4, 3.19
Male	26 (53.1%)	27 (49.1%)

Note. Frequency and percentage are reported in Table 2 except as otherwise noted.

4 | DISCUSSION

Despite significant national efforts, childhood obesity is a critical public health issue that disproportionately affects the low-SES population. Our study adds to the literature by using this early education approach to specifically target the low SES population and address the barriers to development of a healthy lifestyle that this population faces.

Consistent with our hypothesis, our preliminary findings demonstrate that the healthy lifestyle curriculum significantly increased parent nutritional knowledge and knowledge of healthy dietary behaviours, as compared with the control group. This improvement in parent knowledge is similar to that seen from other home visiting interventions targeting parents (Haire-Joshu et al., 2008). Our multisession, long duration, and interactive intervention design is consistent with other obesity prevention or healthy lifestyle interventions effective in increasing knowledge (Stice et al., 2006). This change in knowledge is an important preliminary step towards behaviour change.

The study has a few limitations. This study has shown improvement in knowledge in the short term, but sustainability of this improvement in the long term is unknown. The curriculum is tailored to an urban, low-SES study population, so generalizability to rural low-SES populations may be limited. Additionally, the study population is predominantly African American, which could limit generalizability to other racial groups.

The strengths of our study include tailoring of an early parent education intervention to the needs of the high-risk low-SES population. The video-based modules could feasibly be reliably scaled for wider dissemination. The longitudinal follow up in this 5-year trial will provide key information on sustainability of effects, as well as long-term parent and child outcomes. Follow-up studies are necessary to further investigate how increases in parental knowledge translate into behavioural changes for both parent and child. Future research may examine parental knowledge in relation to behavioural outcomes, such as parent and child food intake, activity logs, and parent–child mealtime behaviours. In conclusion, this study has shown that an intervention focused on low-SES parent knowledge of paediatric healthy eating

TABLE 3 Results of two one-way ANCOVAs testing knowledge across condition at baseline and post-intervention, controlling for parent education level

	Control		Intervention		One-way ANCOVA		
	M	(*SD*)	*M*	(*SD*)	*F*	*df*	95% Confidence interval
Baseline	23.92	4.16	24.13	4.37	0.002	(1, 163)	[−1.28, 1.22]
Post-Intervention	23.84	4.26	26.05	4.24	7.494	(1, 102)	[−3.68, −0.59]

Abbreviation: ANCOVA, analysis of covariance.

and behavioural strategies to promote development of healthy behaviours significantly improved parental knowledge. This study shows the feasibility of reaching and targeting low-SES parents early on to promote healthy behaviours and modelling. Informing and encouraging parents of toddlers to guide healthy eating remains a promising point of intervention for prevention, rather than remediation, of childhood obesity.

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