

Early Child Social-Emotional Problems and Child Obesity: Exploring the Protective Role of a Primary Care-Based General Parenting Intervention

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ABSTRACT: *Objective:* To determine whether early social-emotional problems are associated with child feeding practices, maternal-child feeding styles, and child obesity at age 5 years, in the context of a primary care-based brief general parenting intervention led by an integrated behavioral health specialist to offer developmental monitoring, on-site intervention, and/or referrals. *Methods:* A retrospective cohort study was conducted of mothers with 5-year-old children previously screened using the Ages and Stages Questionnaires: Social-Emotional (ASQ:SE) during the first 3 years of life. ASQ:SE scores were dichotomized “not at risk” versus “at risk.” “At risk” subjects were further classified as participating or not participating in the intervention. Regression analyses were performed to determine relationships between social-emotional problems and feeding practices, feeding styles, and weight status at age 5 years based on participation, controlling for potential confounders and using “not at risk” as a reference group. *Results:* Compared with children “not at risk,” children “at risk—no participation” were more likely to be obese at age 5 years (adjusted odds ratio, 3.12; 95% confidence interval, 1.03 to 9.45). Their mothers were less likely to exhibit restriction and limit setting and more likely to pressure to eat than mothers in the “not at risk” group. Children “at risk—participation” did not demonstrate differences in weight status compared with children “not at risk.” *Conclusion:* Early social-emotional problems, unmitigated by intervention, were related to several feeding styles and to obesity at age 5 years. Further study is needed to understand how a general parenting intervention may be protective against obesity.

(*J Dev Behav Pediatr* 36:594–604, 2015) **Index terms:** social-emotional problems, obesity, feeding, child, integrated behavioral health.

Childhood obesity is a complex problem involving contributing factors at multiple levels, including the child, family, community, and society.¹ Research focused on identifying the early antecedents of obesity has demonstrated that several child developmental characteristics are related to obesity, including negative temperament, poor self-regulation, insecure attachment, behavioral problems, and attention-deficit hyperactivity disorder.^{2–12} Most of these studies have been conducted in school-aged children and adolescents. Few have explored how characteristics that emerge in infancy and

toddlerhood are related to the development of child obesity.

Of the few studies performed during infancy and toddlerhood, poor emotional regulation, negative infant temperament, lower inhibitory control, and higher reward sensitivity have been identified as risk factors in the development of obesity.^{3,5–7,12} These infant characteristics contribute to a larger construct of social-emotional development. Consistent with the American Academy of Pediatrics policy statement calling for universal developmental screening in the first 3 years of life to foster early preventive intervention,¹³ it may be possible to screen for social-emotional development and identify risk factors for the development of obesity.

While most obesity-specific interventions focus directly on diet and physical activity rather than on social-emotional development or general parenting skills, several studies have begun to examine the indirect effect of general parenting programs on obesity.¹⁴ The Family Check Up program, a family-centered intervention to enhance parental attention to adolescent antisocial behavior and to improve parental monitoring and communication, was found to promote higher quality of parent-child relationships, to decrease maladaptive eating attitudes, and to reduce obesity in early adulthood.¹⁵ Randomized control trials of the Incredible

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Years Series,¹⁶ a behavioral family intervention designed for families with 3- to 5-year-old children to reduce harsh discipline, promote child social competence, emotional regulation, and school readiness, demonstrated significantly lower body mass index at follow-up compared with controls.¹⁷ These promising results document that general parenting interventions, which do not focus directly on diet, activity, or weight, may have indirect and sustained effects on both social-emotional development and obesity in preschool and adolescent children. They underscore the need to explore these potential benefits in interventions for parents of infants and toddlers. One study of the Healthy Steps for Young Children program, which aims to assist with developmental and behavioral problems, has demonstrated improved breastfeeding initiation rates and duration.¹⁸ No studies to our knowledge have explored the indirect effects of early parenting interventions on additional feeding behaviors and weight status. Further study is needed to determine the potential protective nature of general parenting interventions on the prevention of early obesity.

Both child diet and maternal-child feeding styles, defined as strategies parents use to regulate feeding, have been linked to child obesity. During infancy and early childhood, parents have the greatest influence over their children's eating environment. Parents' own food preferences and eating behaviors determine which foods are available to young children, and parents also serve as models for children's behavior.¹⁹ Feeding styles, in which parents regulate feeding without responding to child cues or fail to set appropriate limits, have been associated with eating in the absence of hunger, excessive energy intake, increased child eating, and increased child weight gain.^{20,21}

One parenting intervention with potential to influence parental feeding behaviors involves the integration of early childhood behavioral health specialists, called Infant Toddler Specialists (ITS), into the pediatric primary care setting.²² These specialists coordinate universal social-emotional screening, complete follow-up assessments to address the concerns of the parent and provider and provide intervention to families whose children screen "at risk" for social-emotional problems. In consultation with the pediatric provider, 3 levels of service can be provided: close monitoring of families, delivering on-site short-term treatment, or closely following all referrals made for long-term care, caregiver focused care, or child developmental therapies. A study of this program revealed it to be feasible and effective in a large pediatric primary care center within a low-income urban community.²³ While this study documented improved social-emotional risk scores, the impacts of this parenting program on child feeding practices, maternal-child feeding styles, and child obesity were not examined.

Therefore, we aimed to examine the relationship between early social-emotional problems in the first 3 years

of life and child feeding practices, maternal-child feeding styles, and child weight status at age 5 years. We also aimed to determine if a brief general parenting intervention that integrates early childhood behavioral health specialists into primary care pediatrics moderates these relationships. This was accomplished by comparing 3 groups of families: (1) those with children "not at risk" for social-emotional problems; (2) those "at risk" who did not participate in the intervention; and (3) those "at risk" who participated in the intervention. We hypothesized that (1) children who screened "at risk" who did not participate in the intervention would be more likely to exhibit obesity-promoting feeding practices and styles and be obese at age 5 years compared with those "not at risk"; and (2) children who screened "at risk" who participated in the intervention would have similar feeding practices, styles, and weight status at age 5 years compared with those "not at risk."

METHODS

Study Design

We conducted a retrospective cohort study of mother-child pairs who received pediatric primary care at a federally qualified community health center affiliated with an academic medical center in the Bronx in New York City. Mothers with children born between 2004 and 2006, who had participated in universal social-emotional screening as part of routine health care during the first 3 years of life, were identified from the medical record. These mothers were contacted between September 2010 and September 2011 by trained bilingual research assistants in either English or Spanish for a one-time telephone survey interview when their child was 5 years old. Chart review was performed to assess social-emotional development in the first 3 years of life and child growth parameters at age 5 years. This study was approved by the Montefiore Medical Center Institutional Review Board.

Study Sample

We sampled mothers of 5-year-old children who participated in universal social-emotional screening during their child's first 3 years of life as part of routine pediatric care. All mothers with 5-year-old children in this cohort were mailed a description of the study and given the opportunity to decline from being called for the telephone interview. Research assistants subsequently called the mothers to further assess eligibility for the study. The study included mothers who (1) were English or Spanish speaking; (2) were at least 18 years old at the time of the telephone interview; and (3) had a 5-year-old child with at least 1 screen for social-emotional development in the first 3 years of life. The study excluded mothers who (1) had a child with significant medical problems that could impact growth (e.g., congenital heart disease or hydrocephalus) and (2) children with a history of prematurity (less than 37 weeks gestational age). Oral consent was obtained over the telephone.

Assessments

Assessments were collected during the telephone survey and through medical record review.

Independent Variables

Social-Emotional Development

Social-emotional development was screened using the Ages and Stages Questionnaires: Social Emotional (ASQ:SE),²⁴ a parent-completed tool available in both English and Spanish at a fifth-grade reading level. Seven domains of social-emotional development were assessed including self-regulation, compliance, communication, adaptive behaviors, autonomy, affect, and interpersonal interactions. Responses describe whether specific behaviors occurred “most of the time,” “sometimes,” or “never or rarely” as well as any additional maternal concerns. Each question receives a point value of 0, 5, or 10 with an additional 5 points for concern and points are summed to create a final score. Children had the potential to be screened at multiple well-child visits at 6, 12, 18, 24, 30, and 36 months, but only needed to have 1 ASQ:SE screen completed to be included in this study. Although screening for social-emotional health was designed to screen all age-eligible children who presented for well-child visits, only 50% of children were screened more than once. The screens completed were evenly distributed throughout the first 3 years of life with 15% of total screens conducted at 6 months, 16% at 12 months, 18% at 18 months, 20% at 24 months, 13% at 30 months, and 18% at 36 months. Age-adjusted ASQ:SE surveys and empirically valid risk cutoffs exist for each of the age groups screened. Based on the scores, children were categorized as “not at risk” (ASQ:SE scores fell below the empirically validated, age-specific risk cutoffs) or “at risk” (scores fell at or above the risk cutoffs). Psychometrics of the ASQ:SE were high; internal consistency ranged from 67% to 91%, test-retest reliability was 94%, concurrent validity ranged from 81% to 95%, sensitivity ranged from 71% to 85%, and specificity ranged from 90% to 98%.²⁴

General Parenting Intervention

As part of routine care, an integrated early childhood behavioral health specialist, called an Infant Toddler Specialist (ITS), scored and reviewed all ASQ:SE screens.^{22,23} The ITS was a licensed doctoral level child psychologist, with training in evidence based early childhood mental health interventions. Following an elevated screen, the ITS would attempt to offer a more comprehensive evaluation of those children determined to be “at risk,” which included outreach involving up to 2 phone calls and one follow-up letter, as needed. This initial evaluation aimed to discuss maternal and provider concerns, to identify child behavioral, developmental or psychosocial problems, and to assess both maternal and child mental health. Based on these assessments, the ITS provided treatment and/or referral recommendations. Three levels of service were provided based on individual need, including collaborative

monitoring of child development at well-child visits, on-site intervention by the ITS (from one-time consultations to multiple counseling sessions), and outside referral for ongoing needs. The on-site intervention included office and home-based appointments as needed and focused on parenting education regarding behavior, discipline, sleep, feeding, toileting, clarification of developmental goals and abilities of children, and provision of dyadic therapy to address these concerns. Outside referrals were for long-term care, caregiver focused care, or child developmental therapies to agencies such as Early Intervention, Early Head Start, or preschool special education. See Table 1 for a summary of intervention intensity, duration, scope, and specific components. Feeding-related issues were specifically addressed only when feeding was a concern of providers or parents. Feeding education may have addressed the following: breastfeeding difficulties, recommendations for starting solid foods, age-appropriate portion sizes, how to limit juice intake, weaning nighttime feedings, picky eating, and avoiding power struggles during meals.

Social-Emotional Risk Groups

For these analyses, social-emotional development was grouped into 1 of the 3 categories: (1) “not at risk” with all recorded scores falling below risk cutoffs; (2) “at risk—participation” including mothers who responded to initial outreach and whose children received either monitoring, treatment from the ITS, and/or referral to an outside agency; and (3) “at risk—no participation” including mothers who were unresponsive to outreach or refused further services.

Dependent Variables

Child feeding practices and maternal-child feeding styles were collected during the telephone survey and child weight status was collected from medical record review.

Child Feeding Practices

The frequency in the past 7 days of (1) consuming fruits, vegetables, juice, sweetened drinks, and milk; (2) eating family meals; and (3) restaurant eating (including fast food) was assessed. Fruit, vegetable, juice, sweetened drink, and milk consumption were dichotomized (less than every day, daily or more). Mothers reported the number of days most of the family ate a meal together. The frequency of family meals was dichotomized (<5 times per week, ≥ 5 times per week) and restaurant eating was dichotomized (<3 times per week, ≥ 3 times per week). These questions were adapted from the Youth Risk Behavior survey (<http://www.cdc.gov/HealthyYouth/yrbs/index.htm>). The cut-points for dichotomizing these behaviors were based on sample distribution.

Maternal-Child Feeding Styles

Feeding styles are strategies that caregivers use to regulate child feeding. Maternal-child feeding styles were assessed using scales from 3 validated surveys. Scales from the Child Feeding Questionnaire,²⁵ designed for parents of 2- to 11-year-old children to assess beliefs,

Table 1. General Parenting Intervention Led by Colocated Infant Toddler Specialists

Level of Service	Intensity	Duration	Scope	Components
Monitoring	Low level	1–2 sessions	Assess concerns Reassess at later date	Brief counseling addressing concerns
On-site intervention	Mid-level	1–4 sessions	Parental education on developmental milestones and parenting skills Dyadic relationship-based therapy	Expressive language Receptive language Red flags for autism Motor development Toilet training Sleep habits Tantrums/behavior Feeding Parent-child relationship
Referral	High level	Referral for ongoing services	Developmental delays Mental health issues	Early Intervention Early Head Start Committee Preschool Special Education Mental Health Services

attitudes, and practices regarding child feeding, were used: (1) restriction, the parent restricts the quantity or quality of the child's intake even if the child is hungry (3 items, Cronbach's $\alpha = .73$) and (2) pressuring, the parent encourages the child to eat more even if the child is not hungry (4 items, $\alpha = .70$). Scales from the Parenting Strategies for Eating and Activity Scale,²⁶ which assesses parenting strategies related to children's dietary and activity-related behaviors were used: (1) limit setting, the parent limits the child's consumption of unhealthy foods and sedentary activity (6 items, $\alpha = .81$); (2) monitoring, the parent keeps track of the foods the child consumes or the activity the child does (6 items, $\alpha = .82$); and (3) reinforcement, the parent praises healthy habits by giving positive reinforcement (2 items). Scales from Comprehensive Feeding Practices Questionnaire,²⁷ which measures feeding practices of parents with children aged 2–8 years were used: (1) food as a reward, the parent uses food to encourage good behaviors or discourage bad behaviors (3 items, $\alpha = .69$); (2) emotional regulation, the parent uses food to regulate the child's emotions (2 items, $\alpha = .74$); (3) modeling, the parent models healthy eating in front of the child (4 items, $\alpha = .80$); (4) involvement, the parent involves the child in meal planning, cooking, and grocery shopping (3 items, $\alpha = .77$); and (5) healthy environment, a measure of the quality of the food in the home (4 items, $\alpha = .75$). Responses to the items in all of the scales were based on a 1 to 5 Likert scale using either "disagree" to "agree" or "never" to "always." Responses were scored 1 to 5 and mean scores for the items in each scale were generated. Higher mean scores correspond to increased use of the feeding style described.

Child Weight Status

Measured child weight and height at the pediatric 5-year-old well-child visit were obtained from the medical

record. Body mass index (BMI; kg/m^2) was calculated and BMI percentiles were determined for each child using Year 2000 Centers for Disease Control growth data (EpiINFO software version 3.4.1). Child weight status was classified as underweight (<5%), healthy weight (5%–84.9%), overweight (85%–94.9%), and obese (>95%).²⁸

Potential Confounders

Child Characteristics

Child characteristics included gender, being an only child (only child, has siblings), and insurance status (no insurance or Medicaid, commercial). Birth weight was reported by the mother and categorized as small for gestational age (<2.5 kg), appropriate for gestational age (2.5–3.99 kg), and large for gestational age (≥ 4.0 kg).

Maternal Characteristics

Maternal age, race (white, nonwhite), country of origin (US born, non-US born), educational attainment (less than high school, high school or more), marital status (married, not married) and employment status (working, nonworking) were assessed. Maternal depressive symptoms at age 5 years were measured using the Patient Health Questionnaire-9,²⁹ a widely used and validated self-administered screening tool that measures depressive symptoms in the past 2 weeks. Depressive symptoms (on a scale of 0–27) were dichotomized (no depressive symptoms [0–4], depressive symptoms [5–27]). Mothers with depressive symptoms were referred to the social worker for further evaluation. Maternal BMI (kg/m^2) was calculated using self-reported maternal weight and height and categorized based on the Centers for Disease Control and Prevention classifications of adult BMI: underweight (<18.5), healthy weight (18.5–24.9), overweight (25–29.9), and obese (≥ 30).

Statistical Analyses

Data analyses were performed using SPSS statistical software version 18.0 (SPSS Inc, Chicago, IL). Unadjusted analyses exploring the relationships between early social-emotional development (divided into 3 categories: (1) not at risk, (2) at risk—participation, and (3) at risk—no participation) and child feeding practices, maternal-child feeding styles, and child weight status were analyzed using 1-way analysis of variance and χ^2 analyses. The relationships between social-emotional development and child feeding practices and maternal-child feeding styles were analyzed using logistic regression for categorical outcomes and linear regression for continuous outcomes, respectively, using “not at risk” as the reference variable. In these regression analyses, we adjusted for the maternal and infant characteristics associated with social-emotional development with a $p < .10$ (child gender, insurance status, maternal education, employment status, and depressive symptoms). Logistic regression analyses were used to determine the relationship between social-emotional development and child weight status, controlling for potential confounders and using “not at risk” as the reference variable. All analyses using child weight status were done on a sample size of 281, because 29% of the sample was no longer receiving primary care at the study site and did not have 5-year-old weights and heights recorded in the medical record. These analyses were adjusted for child gender, insurance status, maternal education, employment status, depressive symptoms, birth weight, and maternal weight status.

RESULTS

Study Sample

A total of 781 mothers with 5-year-old children were identified from the clinical cohort (Figure 1). We were unable to contact 251 mothers (31.8%) because of incorrect contact numbers. Of the 530 mothers assessed for eligibility, we excluded 4 (0.7%) who had died, 10 (1.8%) whose children had severe medical problems, 51 (9.4%) whose children were born premature, and 9 (1.6%) who did not speak English or Spanish. Of the 456 remaining mothers, 120 (26.3%) refused to complete the telephone interview resulting in 336 mothers in the analyses. Of the 120 mothers who refused to participate in the follow-up telephone interview, 102 (85%) were classified as “not at risk,” 12 (10%) were “at risk—participation,” and 6 (5%) were “at risk—no participation.” Of the 336 interviews, 22 (6.5%) were conducted in Spanish.

Social-Emotional Development and Associated Family Characteristics

Sample characteristics are provided in Table 2. Seventy-nine children (23.5%) screened “at risk” for social-emotional problems at least once in the first 3

years of life. Of these “at risk” screens, 52 (66%) participated in the intervention and 27 (34%) did not participate in the intervention (Figure 1). Of the 79 children with positive screens for social-emotional problems, 15 (18%) had repeat positive screens. These repeat screens were evenly distributed across the groups with 9 in the “at risk—participation” group and 6 in the “at risk—no participation” group. Children “at risk” for social-emotional problems were more likely to be male and have either Medicaid or no insurance and to have mothers who had less than a high school education, were nonworking, and were more likely to have depressive symptoms than those mothers with children “not at risk.”

Children “At Risk” Whose Parents Participated in the Intervention

Compared with families with children “not at risk,” the group “at risk—participation” demonstrated similar child feeding practices and maternal-child feeding styles. The only differences were that individuals in the “at risk” group who participated in the intervention were less likely to have a child with daily juice consumption (adjusted odds ratio [AOR] 0.50, 95% confidence interval [CI] 0.26 to 0.94) (Table 3) and less likely to monitor their child’s diet (Table 4) than the “not at risk” group. With respect to child weight status, “at risk” children whose mothers participated in the intervention demonstrated similar rates of obesity at age 5 years as children who were “not at risk” (Table 5 and Figure 2).

Children “At Risk” Whose Parents Did Not Participate in the Intervention

Compared with children “not at risk” for early social-emotional problems, children “at risk” whose mothers did not participate in the intervention demonstrated multiple differences in child feeding practices, maternal-child feeding styles, and child weight status. The “at risk” children were less likely to have daily fruit consumption (unadjusted odds ratio, 0.45; 95% CI, 0.20 to 0.99), although this did not remain significant after controlling for confounders (Table 3). Mothers in the group “at risk—no participation” were significantly less likely to exhibit restriction and to practice limit setting and were more likely to exhibit pressuring to eat than mothers in the “not at risk” group (Table 4). Mothers in the group “at risk—no participation” were more likely to have an obese 5-year-old child (AOR, 3.12; 95% CI, 1.03–9.45) than mothers in the “not at risk” group (Table 5 and Fig. 2).

DISCUSSION

In this study of low-income racial and ethnic minority families, early social-emotional risk in the first 3 years of life was related to child obesity at age 5 years. Children who screened “at risk” for social-emotional problems, who did not participate in the general parenting intervention, were more likely to be obese than children

Table 2. Family Characteristics Based on Risk of Early Social-Emotional Problems

	Total Sample (n = 336)	Not at Risk (n = 257)	At Risk—Participation (n = 52)	At Risk—No Participation (n = 27)	<i>p</i>
Child characteristics					
Male, n (%)	182 (54.2)	129 (50.2)	35 (67.3)	18 (66.7)	.03*
Only child, n (%)	81 (24.6)	62 (24.7)	13 (25.5)	6 (22.2)	.95
Birth weight, n (%) ^{a,b}					.30
SGA	10 (3.1)	5 (2.0)	3 (6.1)	2 (8.3)	
AGA	294 (90.7)	230 (91.6)	43 (87.8)	21 (87.5)	
LGA	20 (6.2)	16 (6.4)	3 (6.1)	1 (4.2)	
Insurance status, n (%)					<.001*
No insurance/Medicaid	239 (71.1)	169 (65.8)	45 (88.5)	24 (88.9)	
Commercial	97 (28.9)	88 (34.2)	6 (11.5)	3 (11.1)	
Maternal characteristics					
Age, yr					
Mean	32.7	33.0	31.6	31.9	.22
SD	5.8	5.8	5.7	6.0	
Nonwhite, n (%)	303 (90.2)	230 (89.5)	47 (90.4)	26 (96.3)	.53
US born, n (%)	219 (65.8)	168 (66.1)	32 (61.5)	19 (70.4)	.71
Education, <high school, n (%)	42 (12.6)	28 (11.0)	7 (13.5)	7 (25.9)	.08
Married, n (%)	164 (49.2)	126 (49.6)	27 (51.9)	11 (40.7)	.62
Working, n (%)	206 (61.9)	167 (65.7)	29 (55.8)	10 (37.0)	.01*
Depressive symptoms, n (%)	75 (22.5)	49 (19.3)	16 (30.8)	10 (37.0)	.03*
Maternal weight status, n (%) ^c					
Underweight, BMI <18.5	2 (0.6)	2 (0.8)	0 (0)	0 (0)	
Normal, BMI 18.5–24.9	92 (28.7)	71 (28.9)	9 (18.0)	12 (48.0)	
Overweight, BMI 25–29.9	109 (34.0)	83 (33.7)	19 (38.0)	7 (28.0)	
Obese, BMI ≥30	118 (36.8)	90 (36.6)	22 (44.0)	6 (24.0)	

*Significant at $p < .05$. ^aBirth weight was categorized as SGA (<2.5 kg), AGA (2.5–3.99 kg), and LGA (≥ 4.0 kg). ^b $n = 324$ with complete child birth weight data (not at risk, $n = 251$; at risk—participation, $n = 49$; at risk—no participation, $n = 24$). ^c $n = 321$ with complete maternal BMI data (not at risk, $n = 246$; at risk—participation, $n = 50$; at risk—no participation, $n = 25$). AGA, appropriate for gestational age; BMI, body mass index; LGA, large for gestational age; SGA, small for gestational age.

“not at risk.” The mothers in this group were less likely to exhibit limit setting and restriction of child diet and were more likely to pressure their children to eat compared with mothers with children “not at risk.” However, participation in the brief general parenting intervention led by an integrated Infant Toddler Specialist may have been protective against the development of child obesity, given that there were no significant differences in child weight status at 5 years between those “at risk” who participated in the intervention and those who were “not at risk.” In addition, those participating in the intervention exhibited similar maternal-child feeding styles to those “not at risk.” Mothers who participated in the intervention reported less daily child juice consumption than mothers of children “not at risk.”

Social-emotional development in young children is increasingly recognized as foundational for healthy child development. While early social-emotional problems are well documented to lead to adverse effects on child development, behavior, academic performance, and mental health, little is known about the impact of social-

emotional problems on child growth and obesity. Our findings, that a positive Ages and Stages Questionnaires: Social-Emotional (ASQ:SE) screen during infancy and toddlerhood is associated with later childhood obesity (in the absence of intervention), begin to support the potential use of these screening tools to identify children at risk for obesity. An additional benefit of these screens is that a positive score frequently reflects not only the child’s individual characteristics, but also the family context. When interventions successfully target maternal-child relationships, the child’s social-emotional development improves. These concepts are highly applicable to obesity prevention interventions, given that the most successful child obesity prevention interventions use parents as the critical agent of change.³⁰ A review of family-based obesity programs found that interventions that included improving family competence, warmth, cohesion, and overall family functioning resulted in improved diet, activity, and weight loss.³¹

Our study is one of the first to document the potential protective nature of general parenting interventions, which integrated behavioral health specialists into

Table 3. Early Social-Emotional Risk and Child Feeding Practices at 5 Years

Child Feeding Practices	Risk Group	Adjusted Odds Ratio ^a	95% CI
Fruit intake (<daily vs daily or +)	Not at risk	Ref	
	At risk—participation	0.82	0.44–1.55
	At risk—no participation	0.49	0.22–1.14
Vegetable intake (<daily vs daily or +)	Not at risk	Ref	
	At risk—participation	0.92	0.49–1.73
	At risk—no participation	0.98	0.42–2.27
Juice intake (<daily vs daily or +)	Not at risk	Ref	
	At risk—participation	0.50	0.26–0.94*
	At risk—no participation	0.57	0.24–1.34
Sugar-sweetened beverage intake (<daily vs daily or +)	Not at risk	Ref	
	At risk—participation	0.87	0.42–1.78
	At risk—no participation	0.83	0.32–2.15
Milk intake (<daily vs daily or +)	Not at risk	Ref	
	At risk—participation	1.22	0.59–2.52
	At risk—no participation	1.63	0.57–4.62
Family meals together (<5 vs 5 or +)	Not at risk	Ref	
	At risk—participation	1.49	0.69–3.21
	At risk—no participation	0.91	0.35–2.33
Restaurant eating (<3 vs 3 or +)	Not at risk	Ref	
	At risk—participation	1.52	0.62–3.71
	At risk—no participation	1.03	0.27–3.83

*Significant at $p < .05$. ^aAdjusted for child gender, insurance status (no insurance/Medicaid, commercial), maternal education (less than high school, high school or more), employment status (working, not working), and depressive symptoms (no, yes). CI, confidence interval; Ref, reference group.

primary care pediatrics during infancy and toddlerhood, against child obesity. Despite the heterogeneous nature of the brief intervention, these findings are consistent with studies of older children that have documented the indirect effects of several structured general parenting interventions on reduced child body mass index.^{15,17} Our findings support the proposition that primary care-based early parenting programs that have been documented to improve developmental, behavioral, and mental health outcomes may improve physical health outcomes as well. Building on successful primary care-based programs designed to improve developmental outcomes, such as Healthy Steps,³² these findings provide support for utilizing primary care settings for the primary prevention of early child obesity. Intervention programs that promote early parenting skills beginning in infancy may represent an innovative and promising approach to early obesity prevention. Our findings suggest that a brief general parenting intervention that targets individual concerns and needs may be impacting child weight status through providing education about parenting skills, promoting healthy responsive parent-child interactions, and/or providing the care coordination needed to obtain long-term care referrals. However, further study is needed to better understand how the individual components of the multifaceted intervention specifically relate to feeding practices, styles, and growth.

Both child diet and maternal-child feeding styles, defined as strategies parents use to regulate feeding, have been linked to child obesity.^{19–21} By exploring the relationships between early social-emotional problems, child diet, and maternal-child feeding styles, potential pathways for the link between social-emotional problems and obesity may begin to be established. The study findings support that pressuring a child to eat more and decreased limit setting or restriction of a child's diet may represent potential links between early social-emotional problems and growth. Maternal-child feeding styles in which parents are not sensitive to child feeding cues are associated with excessive child weight gain.^{20,21} Non-responsive feeding styles are believed to disrupt a child's self-regulatory capacity, leading to eating in the absence of hunger and continued feeding beyond fullness, and ultimately increased caloric intake.^{20,21} In our study, mothers of children "at risk" who did not participate in the intervention exhibited increased control through pressuring them to eat more, which is believed to encourage eating beyond fullness and overfeeding. These mothers also exhibited decreased limit setting and less restriction of unhealthy foods, consistent with studies documenting that permissive parenting, which occurs when the parent places few demands and neglects to set limits on the child's behavior, has been positively associated with child obesity.³³ Our sample reported high

Table 4. Early Social-Emotional Risk and Maternal-Child Feeding Styles at 5 Years

Maternal-Child Feeding Styles ^a	Risk Group	Mean Scores	SD	Adjusted B (SE) ^b	95% CI
Restriction	Not at risk	4.51	0.81	Ref	
	At risk—participation	4.54	0.88	0.04 (0.13)	−0.23 to 0.30
	At risk—no participation	3.96	1.35	−0.49 (0.18)	−0.83 to −0.14*
Pressuring	Not at risk	3.14	1.17	Ref	
	At risk—participation	3.17	1.20	−0.03 (0.18)	−0.38 to 0.33
	At risk—no participation	3.80	1.04	0.54 (0.24)	0.06 to 1.01*
Limit Setting	Not at risk	4.42	0.71	Ref	
	At risk—participation	4.39	0.83	0.01 (0.12)	−0.23 to 0.25
	At risk—no participation	4.03	0.92	−0.33 (0.16)	−0.65 to −0.01*
Monitoring	Not at risk	4.25	0.68	Ref	
	At risk—participation	3.89	0.89	−0.39 (0.11)	−0.61 to −0.17*
	At risk—no participation	4.10	0.67	−0.19 (0.15)	−0.48 to 0.10
Reinforcement	Not at risk	4.24	1.05	Ref	
	At risk—participation	4.09	1.13	−0.17 (0.17)	−0.49 to 0.16
	At risk—no participation	4.24	0.89	−0.05 (0.22)	−0.48 to 0.39
Food as a Reward	Not at risk	2.23	1.24	Ref	
	At risk—participation	2.58	1.25	0.30 (0.19)	−0.09 to 0.68
	At risk—no participation	2.78	1.48	0.44 (0.26)	−0.06 to 0.95
Emotional Regulation	Not at risk	1.98	0.75	Ref	
	At risk—participation	2.02	0.63	0.02 (0.12)	−0.22 to 0.25
	At risk—no participation	2.28	1.12	0.23 (0.16)	−0.09 to 0.54
Modeling	Not at risk	4.45	0.81	Ref	
	At risk—participation	4.43	0.92	0.01 (0.13)	−0.24 to 0.26
	At risk—no participation	4.56	0.77	0.11 (0.17)	−0.22 to 0.44
Involvement	Not at risk	4.34	0.90	Ref	
	At risk—participation	4.38	0.97	0.08 (0.14)	−0.20 to 0.36
	At risk—no participation	4.27	0.81	−0.02 (0.19)	−0.39 to 0.36
Healthy Environment	Not at risk	4.45	0.66	Ref	
	At risk—participation	4.35	0.78	−0.06 (0.11)	−0.27 to 0.15
	At risk—no participation	4.38	0.73	−0.02 (0.14)	−0.30 to 0.26

*Significant at $p < .05$. ^aScores ranged from 1 to 5. ^bAdjusted B (SE): models adjusted for child gender, insurance status (no insurance/Medicaid, commercial), maternal education (less than high school, high school or more), employment status (working, not working) and depressive symptoms (no, yes). CI, confidence interval; Ref, reference group.

levels of maternal depressive symptoms. This is important because depressed mothers are often less engaged and receptive to their child's needs, resulting in negative mother-child interactions and increased risk of the child's mental, social, emotional, and behavioral prob-

lems.³⁴ In addition, maternal depressive symptoms have been linked to child obesity.³⁵ Larger studies are needed to determine if the relationships between social-emotional problems and obesity are mediated by maternal depressive symptoms.

Table 5. Early Social-Emotional Risk and Child Weight Status at 5 Years^a

Child Weight Status	Risk Group	n (%)	Adjusted Odds Ratio ^b	95% CI
BMI percentile ≥ 95 th	Not at risk	37 (20.8)	Ref	
	At risk—participation	7 (16.3)	0.67	0.25–1.82
	At risk—no participation	8 (42.1)	3.12	1.03–9.45*

*Significant at $p < .05$. ^an = 240 with complete child BMI data after controlling for confounders (not at risk, n = 178; at risk—participation, n = 43; at risk—no participation, n = 19). ^bModels adjusted for adjusted for child gender, insurance status (no insurance/Medicaid, commercial), maternal education (less than high school, high school or more), employment status (working, not working), and depressive symptoms (no, yes), birth weight (SGA, AGA, LGA), and maternal weight status (BMI < 25 , BMI ≥ 25). AGA, appropriate for gestational age; BMI, body mass index; CI, confidence interval; LGA, large for gestational age; Ref, reference group; SGA, small for gestational age.

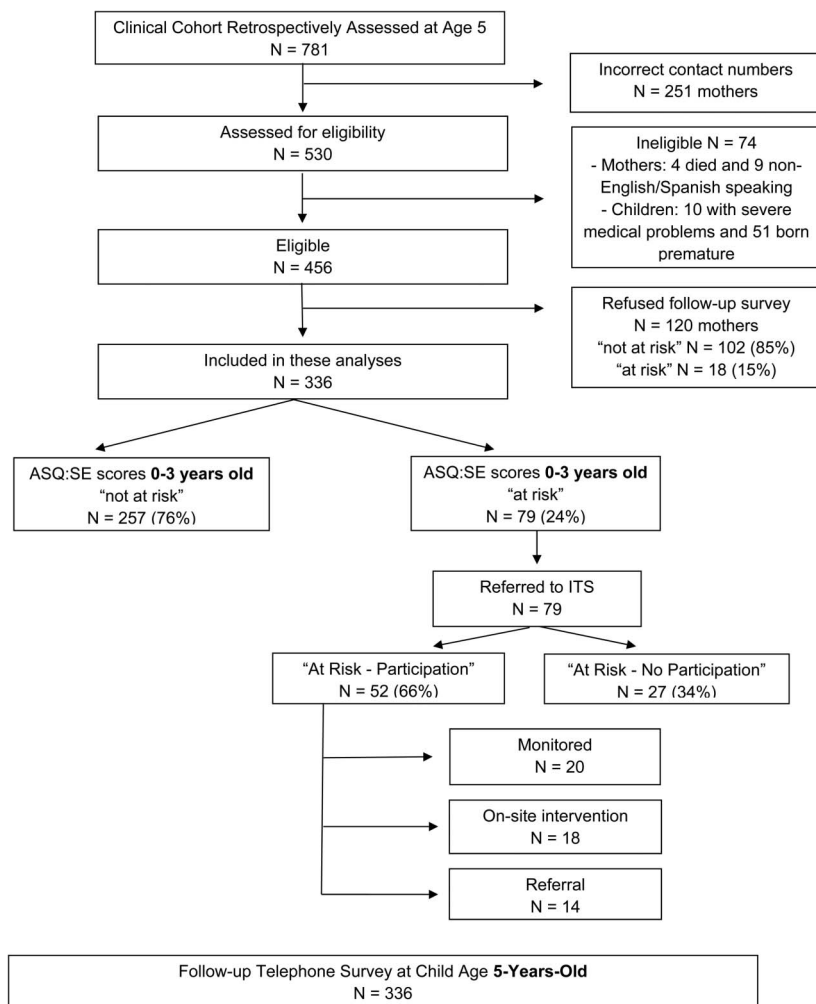


Figure 1. Study overview. ASQ:SE, Ages and Stages Questionnaires: Social-Emotional; ITS, Infant Toddler Specialists.

While early social-emotional problems were associated with child weight and maternal-child feeding styles, few associations were detected with diet content itself. The only significant association found was that children with social-emotional risk who participated in the intervention had lower juice consumption than those not at risk. Given that excessive juice intake has been associated with increased obesity,²⁸ this change in feeding practice may contribute to the prevention of obesity. However, social-emotional problems may be more likely to impact the maternal-child feeding relationship rather than a disruption of diet context itself.

There were several limitations to this study. First, the results are based on low-income, primarily Hispanic and black mothers in the Bronx, and therefore may not be generalizable to other racial, ethnic, or geographic groups. However, because minority, low-income families are known to be at the highest risk of both obesity and social-emotional problems, it is important to explore these relationships in this high-risk group to develop culturally specific preventive strategies.

Second, because this study was not constructed as a randomized control trial, there is a possibility of

selection bias among those parents who did not participate in the intervention. Since poverty is known to have broad effects on parenting, unmeasured poverty-related risks, such as domestic violence, substance abuse, stress, or general chaos in the home may be factors that influence parental decisions to participate in an intervention. Future studies should include other confounders that may help to distinguish the 3 groups at baseline, such as measures of parental compliance with standard medical care visits through no-show rates and vaccination rates. Future studies should also control for involvement in the Supplemental Nutrition Assistance Program and the Special Supplemental Food Program for Women, Infants, and Children, given that these programs provide education related to healthy eating and nutrition. While this study controlled for maternal depressive symptoms at age 5 years, maternal depressive symptoms during the child's first 3 years of life were unknown. Unfortunately, the primary reason for parental refusal to participate in the parenting intervention is also unknown.

Third, given the heterogeneous nature of this general parenting intervention, it remains unclear which specific

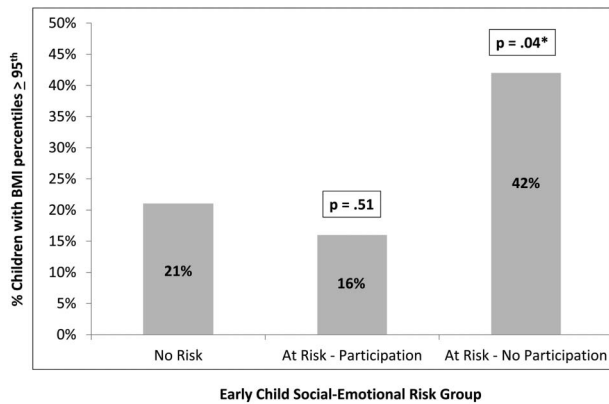


Figure 2. Unadjusted rates of child obesity at age 5 years by early social-emotional risk group. *Significant at $p < .05$ using the “not at risk” group as the reference group. BMI, body mass index.

components of the intervention are needed to impact the child diet, maternal-child feeding styles and child weight status. In addition, it is not possible to distinguish which participants specifically received feeding-specific counseling.

Fourth, most variables were derived from maternal report, which could represent a potential threat to validity given the variability in the mothers’ ability to accurately report the frequency of child behaviors, especially those occurring outside of the home or in child-care settings. In addition, the ASQ:SE is only a screening tool, is maternal report, and is not diagnostic of social-emotional problems.

Finally, some of the children did not have measured 5-year-old weights and heights in their medical record and therefore were not included in the analyses using weight status. Larger sample sizes will be needed going forward to test models of mediation as well as to further explore the impacts of changes in social-emotional risk over time on child weight status. A larger study with subgroup analysis to account for additional confounders will ultimately help to further validate the study findings. In addition, future studies should assess the motivation behind not participating in the intervention to help identify mechanisms linking early social-emotional risk with later child obesity.

CONCLUSION

In summary, this study found that early social-emotional risk in the first 3 years of life was related to child obesity at age 5 years and that participation in a brief general parenting intervention with integrated behavioral health specialists may have been protective against child obesity, even for children with early social-emotional risk. Early social-emotional problems may represent an important early modifiable antecedent of child obesity. Substantial research has demonstrated that healthy parent-child relationships contribute to positive child cognitive, behavioral, social and emotional outcomes. A window of opportunity exists during the first 3

years of life to increase healthy feeding practices and responsive maternal-child feeding styles, before child obesity becomes more problematic. As research continues to support the relationship between early social-emotional problems, child feeding and ultimately child obesity, obesity prevention efforts should emphasize general parenting skills in addition to their focus on diet and activity. Our findings further support the potential benefits of integrating behavioral health specialists into pediatric primary care settings. Integration of behavioral health specialists into pediatrics has great potential for scalability. For example, the Healthy Steps Programs for Young Children have been implemented in more than 50 pediatric practices nationally. While financial costs related to these programs exist due to the office space and the personnel needed to achieve program goals, new models of pediatric care are necessary to impact the rising costs of adult chronic disease related to early social-emotional problems and child obesity.³⁶ Programs like our brief parenting intervention may go beyond the prevention of child social-emotional problems and may represent an opportunity for early childhood obesity prevention as well.

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REFERENCES

1. Davison KK, Birch LL. Childhood overweight: a contextual model and recommendations for future research. *Obes Rev.* 2001;2: 159–171.
2. Lumeng JC, Gannon K, Cabral HJ, et al. Association between clinically meaningful behavior problems and overweight in children. *Pediatrics.* 2003;112:1138–1145.
3. Darlington AS, Wright CM. The influence of temperament on weight gain in early infancy. *J Dev Behav Pediatr.* 2006;27: 329–335.
4. Ternouth A, Collier D, Maughan B. Childhood emotional problems and self-perceptions predict weight gain in a longitudinal regression model. *BMC Med.* 2009;7:46.
5. Graziano PA, Calkins SD, Keane SP. Toddler self-regulation skills predict risk for pediatric obesity. *Int J Obes (Lond).* 2010;34:633–641.
6. Vollrath ME, Stene-Larsen K, Tonstad S, et al. Associations between temperament at age 1.5 years and obesogenic diet at ages 3 and 7 years. *J Dev Behav Pediatr.* 2012;33:721–727.
7. Anderson SE, Gooze RA, Lemeshow S, et al. Quality of early maternal-child relationship and risk of adolescent obesity. *Pediatrics.* 2012;129:132–140.
8. Chang Y, Gable S. Predicting weight status stability and change from fifth grade to eighth grade: the significant role of adolescents’ social-emotional well-being. *J Adolesc Health.* 2013;52:448–455.
9. Fliers EA, Buitelaar JK, Maras A, et al. ADHD is a risk factor for overweight and obesity in children. *J Dev Behav Pediatr.* 2013;34: 566–574.
10. Harrist AW, Hubbs-Tait L, Topham GL, et al. Emotion regulation is related to children’s emotional and external eating. *J Dev Behav Pediatr.* 2013;34:557–565.
11. Suglia SF, Duarte CS, Chambers EC, et al. Social and behavioral risk factors for obesity in early childhood. *J Dev Behav Pediatr.* 2013; 34:549–556.

12. Bergmeier H, Skouteris H, Horwood S, et al. Associations between child temperament, maternal feeding practices and child body mass index during the preschool years: a systematic review of the literature. *Obes Rev.* 2014;15:9-18.
13. Council on Children With D, Section on Developmental Behavioral Pediatrics, Bright Futures Steering Committee, Medical Home Initiatives for Children with Special Needs Project Advisory Committee. Identifying infants and young children with developmental disorders in the medical home: an algorithm for developmental surveillance and screening. *Pediatrics.* 2006;118:405-420.
14. Gerards SM, Sleddens EF, Dagnelie PC, et al. Interventions addressing general parenting to prevent or treat childhood obesity. *Int J Pediatr Obes.* 2011;6:e28-45.
15. Van Ryzin MJ, Nowicka P. Direct and indirect effects of a family-based intervention in early adolescence on parent-youth relationship quality, late adolescent health, and early adult obesity. *J Fam Psychol.* 2013;27:106-116.
16. Webster-Stratton C. *Incredible Years Ser Parent Program (Basic Preschool Version)*. 1989. Available from www.incredibleyears.com. Assessed June 1, 2015.
17. Brotman LM, Dawson-McClure S, Huang KY, et al. Early childhood family intervention and long-term obesity prevention among high-risk minority youth. *Pediatrics.* 2012;129:e621-e628.
18. Johnston BD, Huebner CE, Tyll LT, et al. Expanding developmental and behavioral services for newborns in primary care; effects on parental well-being, practice, and satisfaction. *Am J Prev Med.* 2004;26:356-366.
19. Hoerr SL, Hughes SO, Fisher JO, et al. Associations among parental feeding styles and children's food intake in families with limited incomes. *Int J Behav Nutr Phys Act.* 2009;6:55.
20. Hurley KM, Cross MB, Hughes SO. A systematic review of responsive feeding and child obesity in high-income countries. *J Nutr.* 2011;141:495-501.
21. DiSantis KI, Hodges EA, Johnson SL, et al. The role of responsive feeding in overweight during infancy and toddlerhood: a systematic review. *Int J Obes.* 2011;35:480-492.
22. Briggs RD, Racine AD, Chinitz S. Preventive pediatric mental health care: a co-location model. *Inf Ment Hlth J.* 2007;28:481-495.
23. Briggs RD, Stettler EM, Silver EJ, et al. Social-emotional screening for infants and toddlers in primary care. *Pediatrics.* 2012;129:e377-e384.
24. Squires J, Bricker D, Heo K, et al. Identification of social-emotional problems in young children using a parent-completed screening measure. *Early Child Res Q.* 2001;16:405-419.
25. Birch LL, Fisher JO, Grimm-Thomas K, et al. Confirmatory factor analysis of the child feeding questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite.* 2001;36:201-210.
26. Larios SE, Ayala GX, Arredondo EM, et al. Development and validation of a scale to measure latino parenting strategies related to children's obesigenic behaviors. The parenting strategies for eating and activity scale (PEAS). *Appetite.* 2009;52:166-172.
27. Musher-Eizenman D, Holub S. Comprehensive feeding practices questionnaire: validation of a new measure of parental feeding practices. *J Pediatr Psychol.* 2007;32:960-972.
28. Barlow SE, Expert C. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics.* 2007;120(suppl 4):S164-S192.
29. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med.* 2001;16:606-613.
30. Golan M, Crow S. Parents are key players in the prevention and treatment of weight-related problems. *Nutr Rev.* 2004;62:39-50.
31. Kitzman-Ulrich H, Wilson DK, St George SM, et al. The integration of a family systems approach for understanding youth obesity, physical activity, and dietary programs. *Clin Child Fam Psychol Rev.* 2010;13:231-253.
32. Minkovitz CS, Hughart N, Strobino D, et al. A practice-based intervention to enhance quality of care in the first 3 years of life: the healthy steps for young children program. *JAMA.* 2003;290:3081-3091.
33. Rhee KE, Lumeng JC, Appugliese DP, et al. Parenting styles and overweight status in first grade. *Pediatrics.* 2006;117:2047-2054.
34. Lovejoy MC, Graczyk PA, O'Hare E, et al. Maternal depression and parenting behavior: a meta-analytic review. *Clin Psychol Rev.* 2000;20:561-592.
35. Gross RS, Velazco NK, Briggs RD, et al. Maternal depressive symptoms and child obesity in low-income urban families. *Acad Pediatr.* 2013;13:356-363.
36. Coker TR, Windon A, Moreno C, et al. Well-child care clinical practice redesign for young children: a systematic review of strategies and tools. *Pediatrics.* 2013;131(suppl 1):S5-S25.