Curr Nutr Rep (2017) 6:171–189
DOI 10.1007/s13668-017-0207-9

FOOD ACCEPTANCE AND NUTRITION IN INFANTS AND YOUNG CHILDREN (H COULTHARD, SECTION EDITOR)

# Are Family Routines Modifiable Determinants of Preschool Children's Eating, Dietary Intake, and Growth? A Review of Intervention Studies

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Published online: 13 May 2017


**Abstract**
*Purpose of Review* Children's eating behaviors are critical determinants of their dietary intake and, hence, childhood growth. Nutritional interventions among families with young children are focused on parents as agents of change, with interventions increasingly targeting family routines as drivers of children's eating and health outcomes. This review describes studies that have acted on family routines in the context of preschoolers' eating and growth, summarizes their findings, and discusses the limitations of current approaches to studying family routines and the implications for future research.
*Recent Findings* We found that food availability and parental offering of foods have been modified by several interventions and linked to positive changes in child outcomes. Parent interventions have had success in reducing controlling feeding practices and improving self-efficacy related to child feeding, but these have not been associated with long-term change in child outcomes.
*Summary* We conclude that opportunities exist to strengthen the definition, operationalization, and measurement of family routine variables. Improvements in fidelity and process evaluation measures will be important for more efficacious intervention development and dissemination.

This article is part of the Topical Collection on *Food Acceptance and Nutrition in Infants and Young Children*

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**Keywords** Preschooler · Nutrition · Growth · Family eating routines · Intervention

## Introduction

Children's eating behaviors are an important driver of their dietary intake and, hence, childhood growth. Eating behaviors that develop in childhood can persist into adulthood and influence nutrition across the life course [1, 2]. Early childhood is therefore a critical window to shape life-long eating behaviors and dietary patterns. The preschool years represent a developmental period when children are learning about food through repeated exposure, acquiring food preferences, developing the necessary motor skills to self-feed, and learning to exert these preferences and skills [3]. Early childhood is a period of rapid eating development that is concomitantly challenging and frustrating for caregivers [4, 5].

Among preschool children in the developed world, difficult eating behaviors, such as food neophobia, food refusal, and selective eating, are common [6]. These types of eating behaviors predictably emerge between ages 2 and 5 years [7] and are associated with nutritional problems that are widespread among preschool children, such as inadequate fruit and vegetable intake and mixed associations with growth [8–11]. The preschool years are an opportune time to intervene on eating because children in this age group are increasingly autonomous in making choices about how much and what to eat, yet their adult caregivers still exert a high degree of control over the environment [12].

Extensive evidence supports that parents can shape children's eating and growth [12], and thus, nutritional interventions among families with preschoolers are increasingly focused on parents as agents of change [13]. Numerous clinic-, center-, and community-based interventions in this population

target outcomes such as parent knowledge of children's nutritional requirements or parents repeatedly exposing their children to vegetables [14–16]. Findings from these studies are mixed; some show a positive intervention effect on children's eating or growth, while many do not [17, 18]. The variability in effectiveness of interventions has been ascribed to their differing theoretical frameworks, differences in implementation and fidelity of the interventions, as well as wide variation in the outcomes assessed (and the rigor of these assessments) across interventions [19].

One novel and promising approach to improving children's eating is to help parents to create and sustain family routines [20]. Routines previously have been conceptualized as "the activities we do each day from the time we wake up to the time we go to sleep again at night" [21]. Research in the fields of education and psychology has long shown that the structure, security, and stability provided by routines support the development of positive behaviors and academic achievement among children [22–24]. In general, caregiving routines can establish predictable environments which, in turn, support learning through experience and choice—key aspects for young children's development [24]. In the study of developmental aspects of children's eating behaviors, cross-sectional, qualitative, and longitudinal studies document a relationship between eating-related family routines and children's nutrition outcomes [25–30]. Understanding the relations between family routines and children's outcomes and identifying essential elements of routines and their relative impacts will be crucial for establishing effective interventions to improve children's eating.

In recent years, a number of interventions have been designed to act on family routines as a way to promote healthy eating and growth among preschool children. No reviews to date have examined the types of family routines studied or the effectiveness of these interventions. The purpose of the current review is to describe the studies that have acted on family routines in the context of eating and growth among preschool children, to summarize their findings, and to discuss the limitations of current approaches to studying family routines and the implications for future research.

We define family routines as the way families behave and organize themselves to achieve their goals and specifically concentrate on the variables that shape family routines related to eating (see Fig. 1), as defined below:

1. Home environment routines*:* We focused on food availability, defined as the presence of particular foods in the home.
2. Parent feeding routines: We identified the behaviors and approaches used by parents to:

(a) Feed their children (parent feeding practices and styles)
(b) Model eating behaviors for their children such that, when observed by children, they generate and shape eating-related social norms for the family (role modeling)
(c) Create structure related to food and eating (mealtime routines)
(d) Determine how and when foods are offered to children (parental offerings of foods)

Last, we also included the construct of *parental self-efficacy*, defined as confidence in the ability to exercise control over one's behaviors and to consistently enact those behaviors [31]. Self-efficacy is focal to Social Cognitive Theory (SCT)—a common theoretical framework for interventions aiming for behavior change. Bandura posited that self-efficacy is an essential component of "triadic reciprocality": personal factors, behavior, and environmental influences

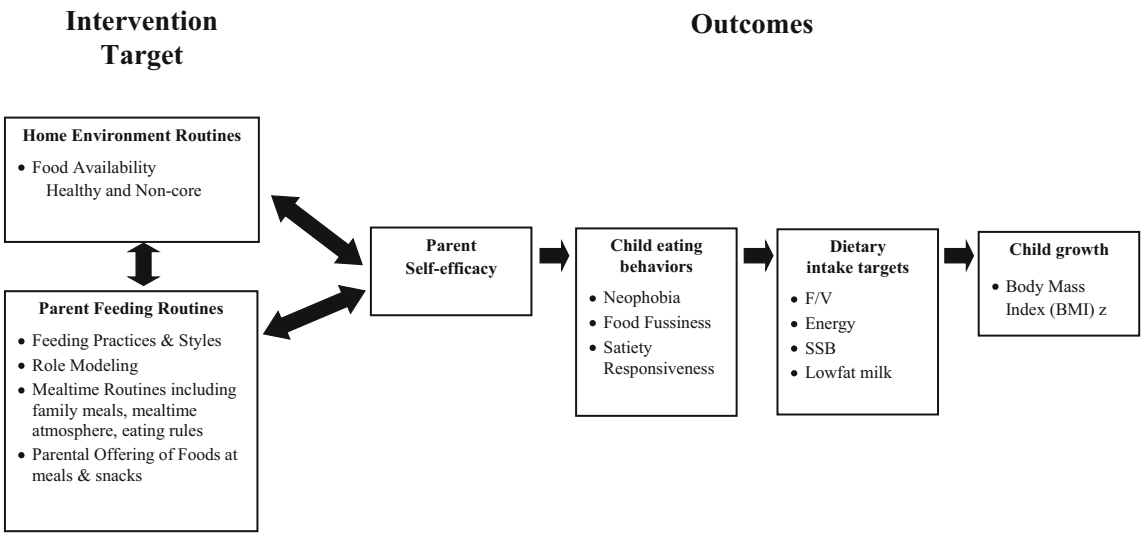


**Fig. 1** Model utilizing the Social Cognitive Theory framework for examining the impact of interventions focusing on family routines to impact children's eating, dietary intake, and growth

which interact to produce behavior change [32]. We therefore conceptualized that self-efficacy would be an important element to include when considering the effectiveness of interventions aimed at family routines and their impacts on child eating and growth outcomes.

The primary questions addressed in this review are:

1. What family routines have been studied in the context of nutritional interventions among preschool children?
2. Were these studies effective at modifying family routines and, if so, do changes in family routines mediate the relationship between intervention impacts and child eating or growth?
3. How can the limitations of current approaches to studying family routines in nutritional research be addressed to move the field forward and support optimal child eating and growth?

## Methods

### Search Strategy

A search was conducted of two databases: Ovid Medline and Embase. The search strategy was designed to identify peer-reviewed articles that described home-based interventions, targeting family routines related to child eating, among families with preschool-aged children. The search was limited to human studies, in English, published between January 1, 2000, and July 15, 2016 (see Table 1). The age range was restricted to the category "Preschool Child: 1–6 years" in Embase and "Preschool Child (2 to 5 years)" in Ovid Medline. Observational, cross-sectional, and qualitative studies, as well as papers that were not an original research article, were excluded. Pilot and feasibility studies were excluded unless the study design was a randomized controlled trial. Methods papers that did not include any results and review papers were read to identify the types of family routines that have been evaluated and the tools used to measure those routines, and then excluded. Studies that were conducted in a developing country or focused solely on a special needs population (e.g., children with developmental delays) were excluded. Findings were categorized and reported by type of family routine: (1) home environment routines (including food availability) and (2) parent feeding routines (including feeding practices and styles, role modeling, mealtime routines, and parent offering of foods). Also considered was whether self-efficacy was measured as a central outcome or a mediator of other intervention outcomes. Studies that targeted any of the above family routines as part of the intervention, as well as studies that actually measured the above family routines at baseline and post-intervention, were included in the final list of publications for this review. For each publication, the following data were extracted and entered into a spreadsheet: year of publication, study population (sample size, age range, ethnicity, parent income or education level, urban or rural location, country), study design, intervention description, length of follow-up, outcomes, instruments, findings, author-reported limitations, the types of routines that were intervened on or measured, inclusion of the theoretical framework in intervention design and assessment, and fidelity and process evaluation measures. Studies in the spreadsheet were then grouped by the type of family routine they addressed and further sub-divided into studies that showed a positive intervention effect and those that did not. In four cases, the articles referred to other publications which reported other findings from the studies' primary or secondary aims. These articles ($n$ = 8) were then added to the list of studies, and the same information as above was extracted from each article.

**Table 1** Search terms for interventions targeting families with preschool-aged children

| |
|---|
| Text words: parent* or mother or father AND pediatric or young child* or toddler* or preschool* or pre-school* AND intervention* or prevention or implement* or program* or curricul* or strateg* AND feeding or eating or willingness to try or neophobia or pressure to eat or self-efficacy or family meal AND Obes* or overweight or BMI or weight or growth or diet or routine or schedule or daily |
| MeSH (Ovid Medline): parenting or child or preschool or child rearing or parent-child relations or father-child relations or mother-child relations AND program development or program evaluation AND food habits or eating or food preferences |
| Emtree (Embase): parent AND toddler or preschool child or child parent relation or parental behavior or child rearing AND program development or program evaluation or nutrition education or intervention study or parenting education or early childhood intervention or evidence based practice or health promotion AND feeding or feeding behavior or child nutrition AND childhood obesity |

## Results

### Summary of Included Studies

The search strategy yielded 1946 articles. The 26 original articles and 1 abstract that met the inclusion criteria are summarized in Table 2. The table includes the study design and population, intervention duration, assessment time points, family routines targeted by the intervention, and a brief description of the intervention methods. Also included in Table 2 are outcomes and how they were measured, findings, and author-reported limitations, use of theory in intervention design, measurement of implementation fidelity, and process evaluation. All of the studies evaluated an intervention, and all but two studies were randomized controlled trials. The majority of studies were conducted in the USA and

**Table 2** Intervention studies focused on household structure and routines among families with preschoolers

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Essery et al. [33]<br>*Journal of Nutrition Education and Behavior*<br>*MOPS*<br>USA | RCT[b]<br>Age: 2–5 years ($n$ = 117)<br>I, C<br>12 weeks<br>Baseline, post--intervention | Feeding practices<br>Newsletter, booklets | Feeding practices (pressure to eat, restriction, monitoring) | Child Feeding Questionnaire | Intervention was effective at reducing pressure to eat, but not other feeding practices. | Self-report Outcomes; less than 1-year follow-up | No theory reported<br>No fidelity measures reported<br>90% read some or all of materials; 87% reported liking program |
| Haines et al. [34]<br>*JAMA Pediatrics*<br>*Healthy Habits, Happy Homes*<br>USA | RCT[c]<br>Age: 2–5 years ($n$ = 121)<br>I, C<br>24 weeks<br>Baseline, post--intervention | Family meals<br>Motivational coaching via home and phone (4 ea), texts | Frequency of family meals, BMI | Project EAT survey for family meals, anthropometry | No intervention effect on family meal frequency. Child BMI decreased by a mean of 0.18 kg/m$^2$ in the intervention group and increased by 0.21 kg/m$^2$ in the control group. | Self-report Outcomes; less than 1-year follow-up | No theory reported; use of evidence-based strategies<br>No fidelity measures reported<br>77% completed 4 home visits; 37% completed 4 phone calls |
| Haire-Joshu et al. [35]<br>*Preventive Medicine*<br>*High 5 for Kids*<br>USA | Randomized nested cohort[c]<br>Age: 2–5 years ($n$ = 1306)<br>Rural families<br>I, C<br>Variable (6–11 months)<br>Baseline, post--intervention | F/V availability, role modeling, non-coercive feeding practices<br>4 home visits (60 min), tailored newsletters, storybooks | Child and parent F/V intake, no. of times per week child observed parent eating F/V, no. of F/V present in the home in the last week | St. Louis University for Kids FFQ; survey developed for study | Intervention parents reported an increase in F/V servings and availability. Among intervention families, a change in F/V servings offered was a predictor of a child's change in F/V servings. Increase in F/V in normal-weight children but not overweight children. No effects of modeling or non-coercive feeding | Self-report Outcomes; less than 1-year follow-up | SCT, reciprocal determinism<br>No fidelity measures reported<br>78% families received the whole intervention;<br>parents and educators rated intervention as well-accepted |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Hart et al. [36]<br>*International Journal of Eating Disorders*<br>*Confident Body, Confident Child*<br>Australia | RCT[b]<br>Age: 2–6 years<br>($n$ = 372)<br>$I_1$ = packet only,<br>$I_2$ = packet + workshop,<br>$C_3$ = nutrition only,<br>$C_4$ = waitlist<br>6 weeks<br>Baseline, post--intervention | Family mealtimes (atmosphere, schedules, TV viewing, frequency); feeding practices<br>Packet = booklets, poster, children's book, website<br>$I_2$ = workshops<br>2-h group sessions | Family meals as enjoyable, difficulty scheduling family meals, TV during dinner, frequency of family breakfast, instrumental feeding, monitoring | Eating Patterns in Childhood; assessment of family meals, parental feeding practices (emotional feeding, pushing to eat, fat restriction, weight restriction, monitoring) adapted from other measures | Intervention was associated with reduction in TV watching during family meals | Self-report Outcomes; non-diverse sample | Principles of health behavior change<br>No fidelity measures reported<br>Parents reported not reading the booklets (% not reported); program evaluation by parents generally positive |
| Harvey-Berino et al. [37]<br>*Obesity Research*<br>*[No Program Name]*<br>USA | RCT[b]<br>Age: 9 months–3-years<br>($n$ = 43)<br>Native American families<br>I, C<br>16 weeks<br>Baseline, post--intervention | Eating and exercise routines, the importance of rules, role modeling, feeding practices, self-efficacy<br>Peer educator, in home | Energy intake, weight-for-height $z$ in children, BMI in mothers, restrictive feeding practices, self-efficacy to overcome barriers to behavior change | 3-day food diaries, Family Meals Questionnaire, Parent Feeding Style Questionnaire, anthropometry, Child Feeding Questionnaire, survey developed for study for intentions and self-efficacy | Intervention children decreased energy intake. Intervention mothers engaged in less restrictive feeding practices | Self-report Outcomes; small sample size; less than 1-year follow-up | No theory reported<br>No fidelity measures reported<br>All families received all material in 16 weeks |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Knowlden and Sharma [38]<br>*Health Education and Behavior*<br><br>Knowlden et al. [39••]<br>*Health Education and Behavior*<br><br>Knowlden et al. [40]<br>*Health Promotion Practice*<br>*EMPOWER*<br>USA | RCT[b]<br>Age: 4–6 years ($n$ = 57)<br>I, C<br>4 weeks<br><br>Baseline, 4-week, 8-week, and 1-year follow-up measures | Food availability; self-efficacy<br>5 online and home-based intervention + booster session | Maternal self-efficacy, F/V intake, home environment, role modeling | Survey developed and validated for the study. | F/V intake increased in the intervention group at 1-year follow-up. Effects in intervention group facilitated by F/V availability | Self-report Outcomes | SCT<br>Program fidelity, dose received, reach, recruitment, and context >0.90 implementation excellence<br><br>Process evaluation collected after each session by telephone and online survey |
| Morawska et al. [41]<br>*Behaviour Research & Therapy*<br>*Hassle Free Mealtimes/ Triple P*<br>Australia | RCT[b]<br>Age: 2–5 years ($n$ = 86)<br>I, C (waitlist)<br>1 group session<br>Baseline, post--intervention and 6-month follow-up | Parenting skill and confidence relating to child mealtime behavior; parenting to promote consistent discipline and routine<br>2-h group session | Self-efficacy, child mealtime behavior (pace of eating, child eats the right amount, mealtime difficulties), mealtime experience | Parent and Toddler Feeding Assessment; Feeding Experience scale; Child Adjustment and Parent Efficacy Scale; Parenting and Family Adjustment Scale; surveys developed for this study | Improvements with large effect sizes in children's mealtime behavior, parents' mealtime practices, and mealtime parenting confidence, compared to controls | Self-report Outcomes; non-diverse sample; less than 1-year follow-up | No theory reported<br>No fidelity measures reported<br>All material was delivered. High parent satisfaction |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Natale et al. [42]<br>*Journal of Developmental & Behavioral Pediatrics*<br>*Healthy Caregivers, Healthy Children (HC2)*<br>USA | RCT[c]<br>Age: 2–5 years ($n$ = 1211)<br>28 preschools serving low-income families<br>I, C<br>1 school year<br>Planned to be 2-year follow-up | Role modeling, parent F/V intake, meal planning, preparing nutritious snacks<br>Daily curriculum for children; up to 20 lessons for parents; delivered in centers; weekly visits by curriculum specialists | Child and parent F/V intake, "junk" food intake | Food Behavior Checklist; Healthy Kids Checklist | No direct treatment effects on child F/V intake. For both intervention and control, as parents' F/V intake increased, children's F/V intake increased from baseline to follow-up; junk food decreased in intervention and increased in control | Self-report Outcomes; only post--intervention results to date | No theory reported<br>Fidelity planned but not reported<br>Process evaluation planned but not reported |
| Olsen et al. [43]<br>*BMC Public Health*<br>Olsen et al. [44]<br>*The European Journal of Public Health* (abstract only)<br>*Healthy Start*<br>Denmark | RCT[b]<br>Age: 2–6 years ($n$ = 543)<br>Children with high birthweight, overweight mother, or low-SES<br>I, $C_1$ (diagnosed overweight), $C_2$ (unaware)<br>1½ years<br>Baseline, post--intervention | Frequency of breakfast or dinner as a family, mealtime social climate, offering F/V<br>Intervention not standardized; "individual guidance" by health consultant; up to 10 visits per participant; cooking classes | BMI$z$, % body fat, frequency of breakfast or dinner as a family, mealtime social climate, added sugars, offering F/V | Anthropometry, bioelectrical impedance, dietary records, surveys developed for study | Intervention was effective in preventing gain in % body fat. Weight change was not different between groups; decrease in added sugar intake in intervention group (only abstract data available) | Self-report outcomes | Stages of change and motivational interviewing<br>No fidelity measures reported<br>No process evaluation measures reported to date |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Østbye et al. [45]<br>*Preventive Medicine*<br>*KAN-DO*<br>USA | RCT[b]<br>Age: 2–5 years ($n$ = 400)<br>Children with an overweight or obese mother<br>I, C<br>8 months<br>Baseline, post--intervention | Role modeling, feeding practices and styles, snacks and dinner in front of the TV, routines for meals eaten together, food availability<br>8 monthly interactive kits, 8, 20–30 min telephone coaching sessions, 1 group session | Child BMI $z$-score, F/V, SSB, fastfood intakes, maternal weight, energy intake; feeding style | Anthropometry, 24-h dietary recall, Family Meals Questionnaire, Parent Feeding Style Questionnaire | Mothers in intervention vs. control reduced instrumental/emotional feeding and TV snacks; there were no group differences in BMI | Self-report Outcomes; non-diverse, highly educated sample | SCT, coaching, MI<br>No fidelity measures reported<br>All received materials; 94% had at least 1 telephone contact, mean = 4.1 calls; 46% attended group session |
| Skouteris et al. [46•]<br>*Pediatric Obesity*<br>*MEND 2–4*<br>Australia | RCT[b]<br>Age: 20–42 months ($n$ = 201)<br>I, C<br>10 weeks<br>Baseline, post--intervention, 6- and 12-month follow-up | Mealtime consistency, role modeling, cooking together, parenting strategies to manage mealtime behaviors<br>10 weekly, 90-min sessions | Child BMI$z$, F/V intake, food neophobia, food fussiness, satiety responsiveness | Anthropometry, Eating and Physical Activity Questionnaire; Children's Eating Behavior Questionnaire; Preschool Child Feeding Questionnaire and Child Feeding Questionnaire | Intervention children exhibited less food neophobia at 12-month follow-up; intervention had a positive effect on vegetable and snack intake and satiety responsiveness, only post-intervention; there were no group differences in BMI $z$-score. | Self-report outcomes, no attentional control | SCT<br>No fidelity measures reported<br>82% attended >7 sessions; other process data not reported |
| Sosa et al. [47]<br>*Health Promotion Practice*<br><br>Yin et al. [48]<br>*Childhood Obesity*<br>*Miranos! (Look at Us! We are Healthy!)*<br>USA | Pre-test, post-test with a control group<br>Age: 3–5 years ($n$ = 197)<br>Hispanic, Head Start families<br>$I_1$ = center-based<br>$I_2$ = center- and home-based,<br>C<br>18 weeks<br>Baseline, post--intervention | Family meals, role modeling, regular eating schedule, healthy eating promotion<br>Peer-led, home- and center-based activities<br>6 sessions | Family-supported behaviors, child behaviors (F/V intake, decrease SSB, increase low-fat milk, decrease intake of high-fat foods), BMI$z$ | Anthropometry, parent recalled messages, measured food intake at lunch, study survey | The intervention was associated with decreased child soda, candy, and sweets intake and decreased weight-for-age $z$-scores but not BMI$z$; among intervention vs. controls, family-supported behaviors increased from baseline to post-test. | Weak study design; self-report outcomes; less than 1-year follow-up | SCT and Systems Theory<br>No fidelity measures reported<br>80% sessions attended;<br>99% of classroom information delivered |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Stark et al. [49]<br>*Journal of Pediatric Psychology*<br>Boles et al. [50]<br>*Journal of Nutrition Education and Behavior*<br>Boles et al. [51]<br>*Children's Health Care*<br>*LAUNCH*<br>USA | Pilot RCT[b]<br>Age: 2–5 years<br>Obese children ($n$ = 42)<br>$I_1$ = home visit, $I_2$ = clinic, C = pediatrician standard of care<br>6 months<br>Baseline, 6- and 12-month follow-ups | Food availability, parenting style, feeding practices, family meals, home environment, neophobia, home visits; 18, 90-min group sessions; provided vegetables | Child BMI$z$, energy intake, F/V intake, parent BMI, home food environment | Anthropometry, 24-h dietary recall, Child Feeding Questionnaire (restriction, pressure to eat), Parenting Styles and Dimensions, Home Environment Survey | Intervention vs. control children showed a greater decrease in BMI $z$-score for $I_1$ home visits (−0.37 vs. −0.07) and greater change in home environment (fewer high energy foods); intervention parents had greater weight loss than control parents; good effect sizes | Self-report outcomes; small sample size; non-diverse sample | No specific theory stated; evidence-based strategies<br>No fidelity measures reported<br>No process evaluation reported |
| Tabak et al. [52]<br>*Journal of Nutrition Education and Behavior*<br>*Family Ties to Health*<br>USA | Feasibility RCT[b]<br>Age: 2–5 years ($n$ = 50)<br>I, C<br>4 months<br>Baseline, post--intervention | Self-efficacy, availability, and offering F/V snacks, prepare dinner at home, eat breakfast or dinner as a family, TV during dinner, social home environment<br>2 calls, 4 newsletters | Child BMI, vegetable intake, offering F/V snacks, self-efficacy, prepare dinner at home, eat breakfast or dinner as a family, TV during dinner | Anthropometry, Healthy Home Checklist, Parenting Survey, Block Kids Food Frequency Questionnaire | Decreased offering of special meals | Self-report Outcomes; small sample size; non-diverse sample | SCT; evidence-based strategies<br>No fidelity measures reported<br>Mean call length = 34 min, parents rated newsletters and calls favorably |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| van Grieken et al. [53]<br>*BMC Public Health*<br>*Be Active, Eat Right*<br>Netherlands | RCT[c]<br>5-year-olds, overweight<br>($n$ = 637)<br>I, C<br>4 clinic visits<br>Baseline, 2-year follow-up | Daily breakfast, eating rules, food availability, outside play<br>Lifestyle counseling, Usual care control | BMI $z$-score, daily breakfast, family breakfast, eating outside the home, no. of eating rules, food availability, home environment | Anthropometry, demographics, and other variables obtained by survey designed for study | There were no differences between groups in BMI, daily breakfast or food availability, or any behaviors | Self-report Outcomes; some measures not yet validated. Poor attendance for all 4 visits | Behavior change theory and stages of change, MI<br>No fidelity measures reported<br>Analysis of information delivered revealed parents most often counseled on reducing sugar-sweetened beverages |
| Walton et al. [54]<br>*Canadian Journal of Public Health*<br>*Parents and Tots Together*<br>Canada | Pilot/feasibility RCT[c]<br>Age: 2–5 years<br>($n$ = 54)<br>I, C<br>9 weeks<br>Baseline, post, 9-month follow-up | Importance of family routines, feeding practices<br>Group sessions, video vignettes, attentional control | Child BMI, parent self-efficacy and stress, using food as a reward | Child Behavior & Dietary Intake: Toddler Care Questionnaire, Child Feeding Questionnaire, study survey | Compared to controls, intervention parents reported lower parenting stress, using food as a reward less frequently and an increase in their child's active play; BMI and dietary intake did not change from baseline to follow-up | Self-report Outcomes; small sample size; non-diverse sample | Social contextual framework, SCT<br>Fidelity was measured through weekly logs and observations of sessions; all content covered<br>Retention high (I = 93%, C = 84%), 89% attended ≥7 sessions |
| Williams et al. [55]<br>*Journal of the Academy of Nutrition & Dietetics*<br>*Eat Well, Play Hard*<br>USA | RCT[c]<br>Age: mean 4.4 years<br>($n$ = 1143)<br>Low-income<br>*I, C*<br>6–10 weeks<br>Baseline, post--intervention | Child-initiated F/V snacking, parent offering F/V, cooking with children<br>Newsletters, up to 10 modules for child program in centers | Child F/V intake, child-initiated F/V snacking, low-fat milk consumption, parent offering F/V | University of California Cooperative Extension Food Behavior Checklist, survey developed for study | Small increases in vegetable intake, child-initiated vegetable snacking, and low-fat milk consumption at home increased in the intervention group parent offering F/V, fruit snacking and fruit intake did not change in the intervention group | Self-report outcomes; less than 1-year follow-up; low participation by parents | SEM<br>No fidelity measures reported<br>Parents did not attend sessions (12%); parents did not report reading newsletters (52%), child mean attendance to classes = 5.04; mean duration of class = 30 min |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Willis et al. [56]<br>*Pediatric Obesity*<br>*HENRY*<br>UK | Cohort<br>Age: preschool ($n$ = 71)<br>Within subject<br>8 weeks<br>Baseline, post--intervention | Self-efficacy, frequency of family mealtimes, children eat at set times (decrease grazing), eating while watching TV, role modeling, family active play, setting limits<br>Group sessions | Child F/V intake, parent self-efficacy, F/V intake, frequency of family mealtimes, eating while watching TV, parent BMI | Food frequency questionnaire, Parenting Self-agency Measure, Family Eating and Activity Habits Questionnaire, parent self-report height and weight | At follow-up, parents reported increased self-efficacy (and limit setting). F/V intake increased among parents and children. Frequency of family meals (and child eating with parent), healthy/home-cooked and structured meals, healthy snacks increased, and eating while watching television decreased; decrease in unhealthy snacks. No effect on adult BMI | Self-report Outcomes; less than 1-year follow-up; use of truncated versions of FFQ and other measures | SCT, goal setting<br>No fidelity measures reported<br>80% attendance at group sessions |
| Wyse et al. [57•]<br>*International Journal of Behavioral Nutrition and Physical Activity*<br>Wolfenden et al. [58•]<br>*American Journal of Clinical Nutrition* | RCT[c]<br>Age: 3–5 years ($n$ = 394)<br>I, C<br>1 month<br>Baseline, post--intervention, 12- and 18-month follow-ups | Food (healthy and non-core) availability, home environment, supportive family routines, role modeling, feeding strategies, offering F/V, eating dinner as a family without the TV; self-efficacy meal planning<br>4, 30-min telephone contacts and print materials for control group | Child and parent F/V, non-core intake and availability, frequency of family meals, frequency of child eating dinner with television, feeding practices (pressure to eat), parental self-efficacy to provide healthy foods | Children's Dietary Questionnaire, Healthy Home Survey, Child Feeding Questionnaire (pressure to eat), Parental Self-Efficacy for Child Diet | Intervention was effective in reducing child consumption of non-core foods at 2 months, but not at 6 months; intervention effects on child F/V intake associated with increases in parent F/V intake (6 and 12 months but not sustained at 18 months) and offering. intervention effects on non-core and F/V intakes at 12 months mediated by food availability and feeding practices (reductions in pressure to eat) | Self-report Outcomes; short FFQ to measure dietary intake; no attention control for control group | SEM, behavior change theory, goal setting<br>No fidelity measures reported<br>100% calls delivered via Computer-Assisted Telephone Interview checklist, 87% materials delivered |

**Table 2** (continued)

| Reference, program name, country | Study design and population[a], groups, intervention duration, timepoints | Routine component and implementation | Outcomes[d] | Measures | Findings | Primary limitations | Use of theory, measurement of fidelity, and process evaluation[e] |
|---|---|---|---|---|---|---|---|
| Fletcher et al. [59] *International Journal of Behavioral Nutrition and Physical Activity* Wyse et al. [60] *American Journal of Clinical Nutrition* *Healthy Habits* Australia | | | | | | | |

*BMI* body mass index, *C* control, *FFQ* Food Frequency Questionnaire, *F/V* fruit/vegetable, *I* intervention, *MI* motivational interviewing, *RCT* randomized controlled trial, *SCT* Social Cognitive Theory, *SEM* Social Ecological Model, *SSB* sugar-sweetened beverages

[a] Detailed population demographics noted only when intervention focused on a vulnerable population

[b] Randomized at the level of the family or individual

[c] Randomized at the level of the preschool, child care center, or community center

[d] Outcomes, including mediating variables where applicable

[e] Fidelity including measurements that demonstrate the intervention was implemented as designed; process evaluation including measures of how the program was implemented, including dose delivered

Australia; the remaining studies were conducted in the UK, Canada, Denmark, and the Netherlands. Of the 26 studies, ten reported changes in body size or composition and 21 reported changes in dietary intake among children from pre- to post-intervention. Approximately one third of the interventions targeted a population at increased risk for poor nutritional outcomes. While many of the interventions targeted routines related to physical activity, sedentary behavior, or sleep, we limited the findings for this review to eating-related family routines. Intervention varied considerably in their intensities (from telephone to in-person contacts), and content was implemented via a variety of strategies which included group sessions, home visits, individual consultations, mailed interactive kits, telephone-based motivational interviewing, newsletters, print materials, and online modules. Almost all interventions targeted at least two family routines. Assessments of family routine and eating-related variables were undertaken using validated questionnaires, modified versions of validated questionnaires, or questions that were not yet validated and had been developed specifically for the study. Children's weight status was primarily assessed using anthropometry. Length of follow-up in the studies ranged from immediately post-intervention to 2 years, with most studies conducting assessments at baseline and post-intervention only.

## Home Environment Routines

### *Food Availability*

Interventions that targeted food availability included in-person, online, and telephone-based education, along with print materials, to target the availability of fruits and vegetables, non-core or high-calorie foods, and/or nutritious snacks. All but one of these studies [35] were randomized controlled trials and used short surveys or single questions to assess food availability; only one study measured food availability by direct observation [49]. Six studies focused on increasing availability of foods that promote healthy eating and growth. The High 5 for Kids study showed that, compared to controls, intervention parents reported a significantly greater increase in the availability of eight different fruits and vegetables in the home (0.45 vs. 0.26 fruits and vegetables) [35]. The EMPOWER intervention had a similar effect on F/V availability in intervention, vs. control, families [38, 39••]. Among participants in the Kind, Assertive, Neutral, Dependable, and Open-Minded parenting (KAN-DO) study, there was a non-significant trend towards greater improvements in healthy food availability in the intervention vs. control arm [45]. The Learning about Activity and Understanding Nutrition for Child Health (LAUNCH) study documented short-term improvements in household F/V availability that were not sustained at the 12-month follow-up [49]. The Be Active, Eat Right study [53] had no impact on the availability of healthy foods in the household. The Healthy Habits study reported no intervention effects on F/V availability; however, availability mediated F/V intakes at the 12-month follow-up [57•].

Four studies focused on reducing availability of foods that are recommended to be eaten in limited amounts, or non-core foods. In the LAUNCH study, the authors reported significantly greater decreases in the number of high-calorie foods available in intervention, vs. control, households (−1.3 vs. −0.1 high-calorie foods) [49]. In the *Miranos!* Look at us! We are Healthy! study, parents in the home-based intervention group reported that their children consumed fewer sodas, candy, sugar-sweetened beverages, and sweets compared to children in the control conditions [47, 48]. The Be Active, Eat Right study had no impact on household availability of unhealthy foods [53]. Similarly, the Healthy Habits intervention targeted and measured non-core food availability, but no long-term effect of the intervention on non-core food availability was noted [57., 58., 59].

All of the studies reported here measured child eating, dietary intake, and/or anthropometric outcomes, and some produced a favorable effect. This included increases in fruit or vegetable intake [35, 38, 39.., 55, 57., 58.], short-term decreases in non-core food intake [59], and greater decreases in BMI *z*-score [49] or body fatness [44] for children in the intervention groups.

## Routines of Parent Feeding

### *Parenting Practices and Styles*

Interventions focusing on feeding styles and practices included telephone-based and in-person health education, as well as print and computerized educational materials. Randomized controlled trials and one randomized nested cohort study assessed the effect of the interventions on feeding practices and styles, most often measured by the self-report measure, the Child Feeding Questionnaire [61], or items developed for the particular study. In KAN-DO, Østbye and colleagues evaluated the effect of a parenting intervention on feeding styles and practices and reported that instrumental and emotional feeding significantly decreased in intervention mothers [45]. A study conducted by Hart and colleagues [36] also evaluated changes in parent feeding practices following the Confident Body, Confident Child (CBCC) intervention to promote healthy eating and weight management. After controlling for baseline scores, significant differences in instrumental feeding (coercion or bribes), emotional feeding, and pushing to eat (most often termed pressure to eat) were noted between intervention parents and active and wait-list controls [36]. Harvey-Berino and Rourke assessed the effect of an obesity prevention plus parenting support intervention on parent feeding practices and showed that intervention mothers reported

decreases in restrictive feeding practices over time [37]. Essery and colleagues similarly found that a mailed newsletter intervention was effective at reducing pressure to eat, but had no impact on other feeding practices [33], and Wyse and colleagues also reported significant differences in pressure to eat post-intervention, between treatment and control families, in the Healthy Habits study [57•]. An evaluation of the Parents and Tots Together intervention by Walton et al. documented that, compared to controls, intervention parents used food as a reward significantly less frequently post-intervention; however, this finding was not sustained at 9-month follow-up [54, 62]. Lastly, the Mind, Exercise, Nutrition, Do It! (MEND 2–4) for families of preschoolers focused on parenting practices (e.g., managing fussy behaviors) but has not yet reported impacts on parenting practices.

Other studies reported no intervention effect on parent feeding styles or practices. Haire-Joshu et al. examined the effect of H5-KIDS (High 5 for Preschool Kids) on non-coercive feeding practices [35]. While the intervention was designed to promote the use of non-coercive feeding practices, the authors found that use of non-coercive feeding practices actually decreased among intervention parents. In a study among obese children with at least one overweight parent, Stark and colleagues reported that parents exposed to the LAUNCH intervention showed no change in restrictive feeding practices or pressure to eat over the course of the study [49]. However, the authors documented a significantly greater decrease in authoritative and permissive parenting styles among intervention vs. control parents.

Six of these eight studies measured child eating, dietary intake, and/or anthropometric outcomes. From pre- to post-intervention, six of the studies reported a significant and positive intervention effect, including decreases in child neophobia and improvements in satiety responsiveness [46•], and increases in fruit and vegetable intake among children [57•], although in the case of High 5 for Kids, only for normal-weight children and not for overweight children [35]. As underweight children did not comprise a large percentage of the sample, a specific determination could not be made for the effects on underweight children. Further, decreases in children's energy intake [37] and in child BMI*z* [49] were also reported. It should be noted that only in the case of the Healthy Habits intervention [59] was change in parent child-feeding strategies specifically tested as a mediator of improvements in child outcomes. In Healthy Habits, parent-reported child-feeding strategies (restriction and coercive practices) were mediators of how the intervention influenced the consumption of non-core foods.

### *Role Modeling*

The majority of studies that evaluated the effect of role modeling did so utilizing telephone-based or face-to-face interventions. Most of these interventions targeted and measured modeling of fruit and vegetable intake; two interventions targeted, but did not measure, role modeling [37, 48]. Typically, role modeling has been measured using a one- or two-item survey or by measuring the mother's dietary intake with a dietary recall or the Food Behavior Checklist, which does not specifically measure the extent to which adults and children eat together [63]. Two studies, Healthy Habits and H5-KIDS, evaluated the number of times per week parents consumed fruits and vegetables in front of their children [35, 57•]. The evaluation of H5-KIDS did not document a change in role modeling of consumption from pre- to post-intervention, though an increase in overall parent F/V consumption was reported. In Healthy Habits, neither role modeling nor parent intake of F/V was different between intervention and control groups at any point post-intervention [57•, 58••, 60]. The KAN-DO study reported an intervention effect for mothers' fruit and vegetable intakes [45]. Two studies used intervention messages to promote positive role modeling related to eating, but did not report whether the intervention modified parental role modeling behaviors [37, 47, 59].

All seven of these studies measured dietary intake. Three interventions reported reductions in energy or non-core food intake [37, 42, 59], two interventions described increases in fruit and vegetable intake [35, 57•], and one intervention found greater decreases in fruit and vegetable intake in the control group compared to the intervention group [42]. Two studies investigated the effects of parental role modeling as a mediator of child dietary intake, and one noted significant positive effects of role modeling on children's F/V intake [42].

### *Mealtime Routines*

A wide range of mealtime behaviors and routines were targeted and/or evaluated, including eating dinner together as a family, mealtime atmosphere, the frequency of television viewing during dinner, meal planning, preparing dinner at home, mealtime rules, and mealtime structure and rules. Some intervention studies specifically targeted mealtime routines and included their measurement while others included messaging and content related to mealtime routines but did not measure or assess change in mealtime behaviors as part of intervention effects. One of the most frequently studied family routines is eating dinner together as a family. Nine studies measured the frequency of family meals [34, 36, 43, 45, 47, 52, 53, 56, 59]. However, only one intervention, Health Exercise Nutrition for the Really Young (HENRY), reported a positive impact on the frequency of family meals [56].

The CBCC study assessed the atmosphere of family mealtimes, including whether mealtimes provided structure and social support, but atmosphere did not vary across intervention and control groups post-intervention [36]. The Healthy Start study assessed mealtime social climate (cozy vs.

conflict-ridden mealtimes); the effects of the intervention on this variable were not reported [43]. Four studies evaluated the intervention effect on television usage during dinner. Three of the studies described a significant intervention effect on children eating a snack or dinner in front of the television or television viewing during family meals [36, 45, 56], while one study showed no effect [52]. The Healthy Habits intervention targeted television viewing during dinner; however, change in this variable was not evaluated from pre- to post-intervention [57•].

A small number of studies also targeted meal planning [42, 52, 59] and preparing dinner at home [45, 52]. Three of the four studies did not measure change in these mealtime behaviors over time, while one reported no significant change from pre- to post-intervention [52].

The Be Active, Eat Right study [53], the Hassle Free Mealtimes/Triple P study [41], and the MEND 2–4 study [64] targeted rules and consistency related to mealtimes. van Grieken et al. showed that intervention, compared to control, families had more rules for healthy and unhealthy behaviors post-intervention [53]. Skouteris and colleagues included a workshop for parents about the importance of consistency related to mealtimes, but did not measure a corresponding variable, and therefore, it cannot be ascertained whether mealtime structure and rules were influenced by the intervention [46•, 64]. Morawska and colleagues reported significant intervention effects but none related to mealtime practices and routines [41].

Eleven of the 13 articles in this content area reported measures of eating, dietary intake, and/or anthropometric outcomes among children, and five of the interventions resulted in significant changes from pre- to post-intervention. Changes included increases in fruit and vegetable intake [46•, 56, 57•], satiety responsiveness [46•], and reductions in food neophobia [46•], non-core food intake [59], and BMI [34]. One intervention found greater decreases in fruit and vegetable intake among control vs. intervention children [52]. No study reported a direct or mediational effect of mealtime routines on child outcomes.

*Parental Offering of Foods*

Five studies addressed both the availability of foods in the household as well as how and when parents offered foods to their children. Three studies showed that parental offering of fruits and vegetables was positively affected by the interventions [52, 57•, 59], while another did not [55]. Both the Family Ties to Health [46•] and the Healthy Habits [57•, 59] interventions separately assessed the effects of F/V availability and parental offering of F/V to their children, though only the Healthy Habits study reported a significant association with children's F/V intakes. Two studies evaluated or used intervention messages to target parental offering of fruits and vegetables, but the findings related to this variable have not yet been published [43, 52]. The Eat Well Play Hard study reported increases in parental offering of vegetables and low-fat milk, which was associated with small increases in vegetable intake, child-initiated vegetable snacking, as well as increased consumption of low-fat milk at home [55].

**Self-efficacy**

Studies evaluating the effect of in-person, online, telephone-based interventions that contained self-efficacy in the model included six randomized controlled trials and one cohort pre-test, post-test design. Self-efficacy was measured using several different surveys including the Child Adjustment and Parent Self-Efficacy scale, the Parental Self-Efficacy for Child Diet scale, the Parenting Self Agency Measure, and surveys developed specifically for studies. Positive intervention effects were reported for self-efficacy for handling emotional and behavioral behaviors (applied to mealtime) [41], preparing healthy meals and encouraging children to eat healthy foods before unhealthy ones [52], encouraging "good behavior," and setting limits related to mealtimes [56]. However, other interventions were not successful with respect to influencing self-efficacy for recognizing the child's satiety cues (measured by a single item developed for the study) [62], providing a healthy diet, and solving problems with their child's eating habits [59].

Five of the six studies measured children's dietary intake and/or anthropometric outcomes. No study reported significant associations between changes in parent self-efficacy and children's intake of F/V or BMI*z*, and few examined self-efficacy as a mediator of intervention effects on child outcomes. While the Healthy Habits study reported a significant relation between parent self-efficacy and children's consumption of non-core foods, the intervention did not impact significantly parent self-efficacy itself [59].

## Discussion

We examined the evidence for effectiveness of interventions that have focused on creating and strengthening family routines designed to improve children's eating behaviors, dietary intake, and growth. It should be noted that the majority of interventions included in this review used routines to augment children's consumption of healthy foods and have done so in the context of obesity prevention or treatment (rather than the spectrum of child growth), though only half collected data related to children's weight outcomes. We concentrated on childhood obesity because of its escalation globally over the last four decades [65] and because of the increase in funding mechanisms focused on preventing early childhood obesity during the time period specified in our search (2000–2016).

We identified studies reporting on 18 interventions, most of which were randomized controlled trials and six of which reported on data collection periods that were a year or more post-intervention.

We examined family routines that included food availability (both healthy and non-core foods), parent feeding practices and styles, parent role modeling, mealtime routines (e.g., frequency of family meals), and parental offering of foods (primarily fruits and vegetables); we further explored whether self-efficacy played a role in the effectiveness of the interventions. A number of interventions reported positive impacts on both food availability and parent offering of foods, and both constructs were associated with increases in children's intake of both healthy and unhealthy foods. Changes in food availability and offering of foods were the only constructs associated with small changes in child weight status across all interventions [44, 49]. One study reported positive effects of offering food to children, over and above those reported for having the food available in the home [57•]. These findings align with Social Cognitive Theory which suggests that environmental and behavioral components interact (along with personal factors) to explain behavior change [32]. In this case, purchasing and making foods available is an initial step towards impacting children's dietary intake, but making the foods salient and accessible by actively offering them to children may increase the impact of the environmental effects. However, none of the studies reported sustained effects on children's food intake, suggesting that one-time interventions are insufficient to produce lasting changes in children's dietary intake.

A number of studies reported intervention effects on parenting practices and styles, particularly the reduction of controlling and restrictive feeding practices [33, 36, 37, 45, 57•, 58•]. Several interventions referred to content related to improving mealtime atmosphere and structure, but results of this facet of the interventions were largely null [35, 49] or unreported. The existing child-feeding practices literature has principally focused upon the negative impact of controlling feeding practices on children's eating and weight outcomes [66]. Instruments which measure feeding practices most often document use of negative strategies and are dependent upon parent self-report (e.g., [61]), which could lead to social desirability response bias and obscure true intervention effects. Alternatively, it may be that reduction in use of restrictive practices is not sufficient to improve children's eating and that concurrently helping parents with supportive feeding practices, i.e., "catching parents doing something right," could be useful to explore in addition to diminishing unproductive strategies.

Limited support was found for the effects of interventions on parental role modeling, and only one study found evidence of a linkage between changes in role modeling and child outcomes [42]. Role modeling was operationalized and measured inconsistently across interventions. In some, parent self-reports of consumption of foods were assumed to be a proxy for role modeling intake of those foods; in others, role modeling was specified as a process of consuming a food at a meal with their children. The extent to which role modeling was an active process (i.e., engaging with the child and drawing the child's attention to the fact that the parent is eating that food) was, for the most part, undefined. Because of the lack of specificity in defining role modeling, its measurement was also highly variable and included quantifying foods consumed, frequency of family meals in which specific foods were consumed, and survey items which asked whether role modeling occurred. It did not, however, include any measurement of sibling impacts, which may also be important in considering role modeling. Given the variability in definition and measurement, the extent to which role modeling is an effective part of interventions cannot be determined.

Mealtime routines included a large range of examples and were most frequently operationalized as eating together as a family. Numerous observational studies have linked family meals to positive child outcomes, including nutritional, scholastic, and behavioral benefits [67]. Of the interventions reviewed here, only one resulted in improvements in the frequency of family meals [56]. Other dimensions of mealtime routines were, for the most part, not measured or reported as part of intervention impacts and none evaluated the relationship between changes in family meals and child outcomes.

Mixed results were reported for intervention impacts upon parental self-efficacy with positive impacts being reported for efficacy for preparing healthy meals, managing difficult mealtime behaviors, and setting limits related to mealtime and eating [41, 52, 56]. Self-efficacy is a central component of Social Cognitive Theory and, as a personal factor in this theoretical framework, interacts with both environmental and behavioral factors. However, an individual's self-efficacy varies across behaviors; that is, high efficacy to make healthy food available does not necessarily confer the same level of efficacy on preparation and ability to eat together as a family. Therefore, the measurement of self-efficacy must parallel the goal and content of the intervention and the specific behaviors which are targeted for intervention. In the studies we examined, measurement of this construct ranged from general parenting agency to efficacy that was quite specific to the behavior and rarely was it examined in relation to changes in the target behavior, environment, or child outcome.

A strength of most of the studies was that they were randomized controlled trials and that some included longitudinal follow-up to ascertain the duration of intervention effects. The majority based their intervention design upon a theoretical framework, most often Social Cognitive Theory, and attempted to measure many components of the models. Some studies targeted or included diverse populations who are at risk for health disparities.

All studies have their shortcomings. Common limitations included (1) poor definition, and therefore inconsistent operationalization, of the routine constructs; (2) assessments with low specificity or limited evidence of psychometric performance; and (3) analytic methods that were not, in general, designed to test the effects of routines (either directly or in mediation models) on child outcomes. Very few studies collected or reported fidelity measures, and therefore, the ineffectiveness of the intervention, or the degree and rigor with which it was delivered, often could not be distinguished. Likewise, the presence and quality of process evaluation were often insufficient and not discussed in relation to intervention findings.

## Implications for Future Research

Child eating behaviors, food intake, and weight outcome are influenced by a complex set of environmental and behavioral variables and therefore require multicomponent interventions to effect changes in their status. However, complex interventions are difficult to design, implement, and assess in a manner that allows for the estimation of effects of individual intervention components. Beyond the need for improvements in construct definition, operationalization, assessment, and increased sophistication of intervention analyses, the application of implementation science principles that include careful measurement of fidelity and processes of implementation will advance the delivery and efficacy of interventions [68]. These processes, when applied rigorously, help to determine dosage, reach, and quality of intervention delivery but also illuminate barriers to program implementation and opportunities for improvements in intervention effectiveness. Implementation science moves beyond outcome evaluation (i.e., results only) and progresses towards understanding the context and mechanisms related to intervention findings. It also provides opportunities for identifying adaptations that could improve effectiveness of the existing intervention, rather than necessarily leading to development of additional intervention programs. As demonstrated in the studies presented here, the inclusion of additional implementation techniques could greatly improve our understanding of intervention outcomes related to family routines, children's eating, and growth outcomes.

## Conclusions

Some evidence was found for the potential to successfully intervene upon family routines, particularly home environment routines as well as some parent feeding routines. Interventions reported positive impacts on parental self-efficacy related to food preparation, managing children's problem behaviors and, to some extent, for developing limits and structure for mealtimes. However, in very few cases were the impacts upon family routines tested for their relation to changes in intervention outcomes. Opportunities to advance the science related to family eating routines and child outcomes include the exploration of mediation and moderation analyses of existing studies, and the inclusion of these variables in the design of future studies to improve our understanding of intervention findings. The application of implementation science principles could speed the development and dissemination of effective programs.

**Acknowledgments** This project is supported by the Agriculture and Food Research Initiative Grant no. 2015-68001-23240 from the USDA National Institute of Food and Agriculture, Childhood Obesity Prevention: Integrated Research, Education, and Extension to Prevent Childhood Obesity – A2101.

**Compliance with Ethical Standards**

**Conflict of Interest** Traci A. Bekelman, Laura L. Bellows, and Susan L. Johnson declare they have no conflict of interest.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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- • Of importance
- •• Of major importance

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