



Making healthy eating pleasurable for children: A systematic review and future research agenda

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ABSTRACT

Childhood obesity remains a major global public health challenge. Research demonstrates that children's pleasurable food experiences may orient children toward unhealthy options unless children learn, early and consistently, to associate pleasure with healthy foods. This review synthesizes interventions designed to link pleasure with healthy eating and evaluate how these approaches can be strengthened or extended. We conduct a systematic literature review of 52 articles and applied the antecedents-decisions-outcomes (ADO) and theories-contexts-and methods (TCM) frameworks to organize existing knowledge and build understanding. We distinguish four antecedents of pleasurable eating experiences: sensory, interpersonal, psychosocial, and physiological. These antecedents influence six key decisions, including healthy food choice, healthy food consumption, healthy and unhealthy food acceptance or avoidance, gustatory interference, and responses to marketing stimuli. We also identify three outcomes: subjective well-being, objective well-being, and childhood obesity prevention. The review reveals limited theoretical development across the field, constraining cumulative knowledge building. Overall, the review offers comprehensive insight into successful interventions for healthy pleasurable eating for children and provides extensive future research directions.

1. Introduction

Childhood obesity remains a major public health challenge worldwide. The World Health Organization (2025) reported that in 2022 over 390 million children aged 5–19 were overweight, with 160 million living with obesity. Because food preferences and eating habits are established early and persist into later life (Nicklaus & Remy, 2013), understanding how eating can be made pleasurable in ways that support healthier diets across childhood and adolescence (6 months–19 years) is critical. Our review aims to synthesize evidence on how pleasure derived from children's food experiences can be leveraged to encourage healthier eating.

Pleasure is an affective state in which individuals feel good, joyful, happy, or satisfied (Mehrabian & Russell, 1974). Such feelings promote approach tendencies and shape how objects are experienced and evaluated (Isen, 1987), making pleasure a central driver of choice and

consumption (Alba & Williams, 2013). In the context of food choice, pleasure is often linked to indulgence and unhealthy intake (Cornil & Chandon, 2016; Wansink & Chandon, 2014). In contrast, healthy eating is commonly framed as a rational, disciplined pursuit that requires willpower and self-control (Delaney & McCarthy, 2014; Dodds & Chamberlain, 2017; Jallinoja et al., 2010). Healthy eating involves consuming a balanced variety across food groups (Chow et al., 2020) while also limiting intake of unhealthy foods (Filgueiras et al., 2019).

Healthy foods are often perceived as less tasty and less enjoyable than unhealthy foods (Raghunathan et al., 2006; Trendel & Werle, 2016). This pleasure-unhealthy association begins early in life, as infants show innate preferences from energy-dense and sweet, pleasure-oriented foods that historically supported survival (Schwartz et al., 2009; Steiner, 1979). Yet what we know is that taste is not fixed. Rather, it is a subjective experience shaped by the consumption context and by cognitive, sensory, and social cues surrounding the eating

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experience (Mahr et al., 2013). Consequently, pleasure is not inherently incompatible with healthy eating; instead, it can be cultivated through conditions under which food is consumed.

Positioning healthy eating as pleasurable is particularly important for children for two key reasons. First, pleasure is a fundamental driver of food choice, and enjoyment derived from consumption reinforces these choices over time (Veldhuizen et al., 2010). This hedonic basis is especially pronounced in childhood, as children's food decisions rely more on immediate enjoyment rather than by deliberative evaluation (Albuquerque et al., 2018; Birch et al., 1999). Second, affective responses often exert a stronger influence on behavior than cognitive nutrition knowledge, especially for children whose cognitive capacities are still developing (Dubé & Cantin, 2000). Marty et al. (2017) illustrate this pattern in a mid-afternoon snack context. In their buffet study, containing both healthy and unhealthy foods, children with more hedonic-based attitudes toward food were more likely to choose healthy options than those with more nutrition-based attitudes, who tended to gravitate toward unhealthy options. This finding suggests that cultivating pleasurable experiences with healthy foods can enhance their appeal and support healthier food choices among children.

Taken together, these insights imply that children's pleasurable food experiences may orient them toward unhealthy options unless pleasure is learned, early and consistently, in relation to healthy foods. Identifying how such associations can be learned is critical. In this review, we synthesize prior research on interventions designed to link pleasure with healthy eating and evaluate how these approaches can be strengthened or extended.

To achieve this aim, we anchor our review in the work of Marty et al. (2018), who conceptualize eating pleasure as a multifaceted construct that can, under certain conditions, support healthy eating. Their narrative review identifies three key dimensions through which pleasurable eating experiences may emerge: sensory experiences during consumption, interpersonal factors related to the social context of eating, and psychosocial factors linked to cognitive representations of food. The relevance of this multidimensional perspective is supported by Poquet et al. (2020, 2022), who tested a pleasure-oriented intervention designed around these dimensions. Their findings suggest that pleasure-oriented interventions may support healthier eating through multiple pathways, including attitudinal change and reduced intake, and highlight the value of systematically examining evidence related to each pleasure dimension. Building on this foundation, we extend Marty et al. (2018) framework through a rigorous systematic review of the literature. This approach enables us to (1) confidently clarify and expand the conceptual scope of food pleasure, adopting a broader perspective on pleasurable healthy eating behaviors among children (2) incorporate the most up-to-date evidence to be able to map current interventions and research gaps, (3) propose an additional physiological dimension of pleasure, and (4) propose ideas for advancing the field forward.

To guide our systematic review, we adopted the ADO (i.e., Antecedent, Decisions, and Outcome)-TCM (Theories, Context, and Methods) framework developed by Lim et al. (2021). This framework allowed us to first clarify and broaden understanding of food pleasure in children by organizing the literature around: (a) pleasure-related dimensions as antecedents, (b) children's behavioral responses to healthy foods as decisions, and (3) well-being outcomes associated with these pleasure dimensions. The TCM component then provides a diagnostic assessment of the theoretical, contextual, and methodological foundations underpinning the evidence base. This sequence enables us to first establish the substantive knowledge base and then critically evaluate how that knowledge has been produced.

There is a need to take stock of existing knowledge around children's food experiences of pleasurable healthy eating. Through a framework-based systematic review, we provide an organized account of the antecedents, decisions, and outcomes (ADO) of pleasure in children's eating experiences, alongside a snapshot of the theories, contexts, and methods (TCM) used to build this understanding.

2. Method

This review followed Arksey and O'Malley (2005) scoping review framework, PRISMA guidelines (Page et al., 2021), and the article selection procedure described by Shamsollahi et al. (2021). Fig. 1 summarizes the search and selection process.

2.1. Identifying the research questions

In this review, food pleasure is defined as an enduring cognitive and emotional value derived from food consumption experiences (Bataat et al., 2019). We consider healthy eating to reflect overall dietary patterns, including the types of foods consumed as well as balance and variety across food groups (Chow et al., 2020), and not limited to fruit and vegetable intake (e.g., DeCosta et al., 2017). This definition entails limiting unhealthy foods, such as ultra-processed foods and foods high in fat, salt, and sugar (Filgueiras et al., 2019). Guided by this framing, we addressed three research questions:

1. What does existing research suggest about pleasure as a driver of healthy food consumption among children?
2. What strategies do families/caregivers, education providers, social marketers, and public policymakers use to leverage pleasure to encourage healthy eating among children?
3. What further research is needed to advance this field?

2.2. Data sources and search strategy

The literature search was conducted in two stages. First, four databases (EBSCO, Emerald, Scopus, and ScienceDirect) were searched in October 2021. The search was then updated in April 2025 using the same databases to identify studies published after the initial search and to ensure that the review was comprehensive and up to date. The initial search was not date-restricted because relevant studies may investigate enjoyable or rewarding eating experiences without explicitly using the term "pleasure." The April 2025 search was restricted to studies published between October 2021 and April 2025. The key search terms consistently used in the search strategy were (1) food types (i.e., "healthy food" OR "unhealthy food"), AND (2) "pleasure", AND (3) target population (i.e., "children" OR "adolescents" OR "youth" OR "child" OR "infant" OR "early childhood"). We included "unhealthy food" to capture work examining whether pleasurable eating experiences can reduce unhealthy consumption and promote healthier diets.

2.3. Eligibility criteria – Identifying relevant studies

Studies were included if they were: (1) published in English; (2) peer-reviewed academic journal articles (i.e., excluding non-peer-reviewed articles, a thesis or a document written by an organization/government, conference abstract, book summary/review, conference/meeting proceedings), (3) published in A* or A-level journals (ABDC ranking) and 4*, 4, or 3 journals (ABS ranking), consistent with established benchmarks (Hao et al., 2020).

2.4. Data screening – Selecting eligible studies

Endnote was used to compile the search results and remove duplicates. Titles, abstracts, and keywords of the remaining articles were screened, retaining those that have one or more of the following words: (1) pleasure (pleasur*, enjoy*, fun, happiness), and (2) the target population (child*, adolescents, youth, infants, early childhood).

2.5. Data extraction and quality assessment

In the first search, two co-authors independently screened abstracts for relevance and classified each article as 'include', 'exclude', or

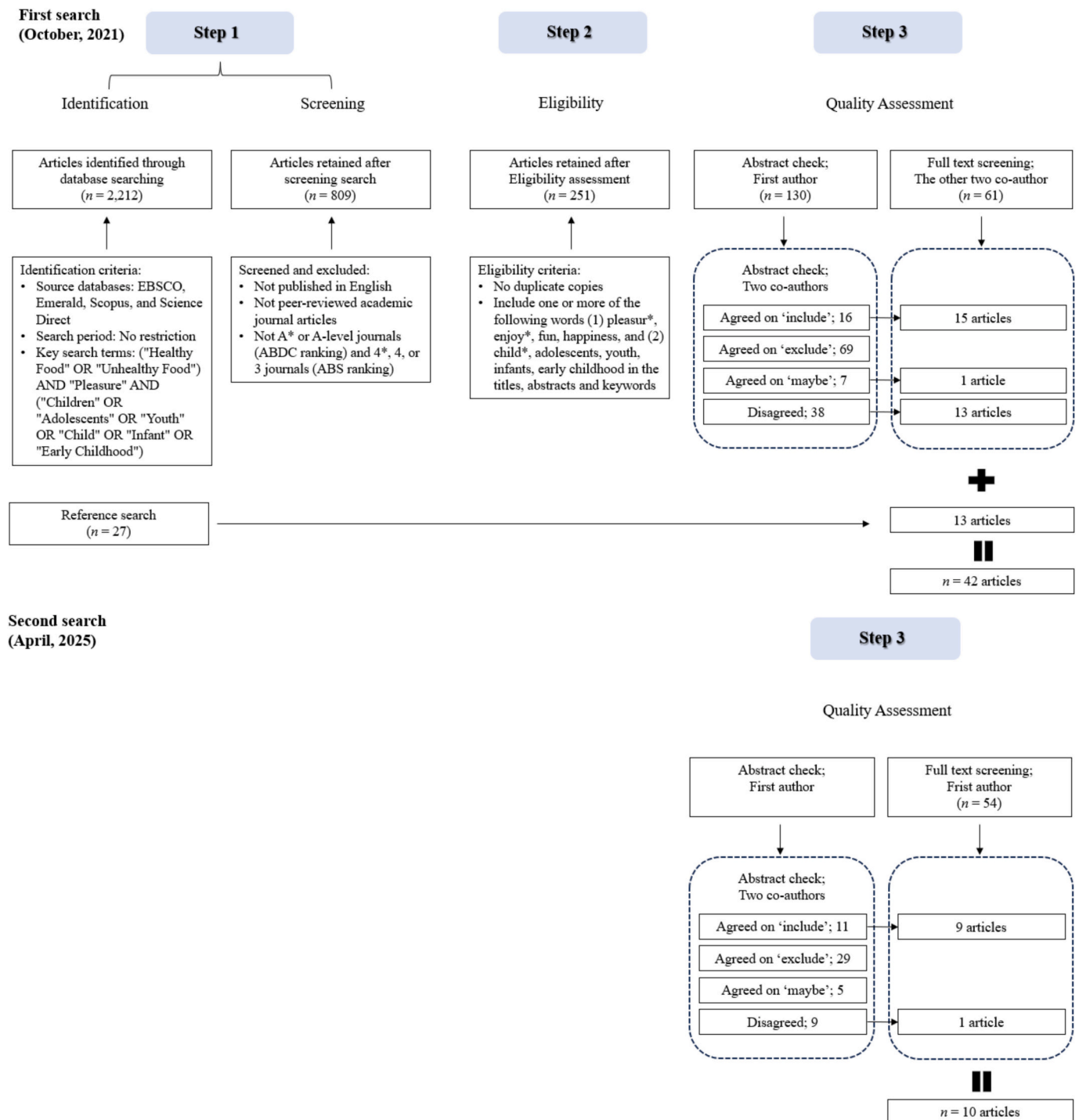


Fig. 1. Literature search and article selection process (adapted from Shamsollahi et al., 2021 and Page et al., 2021).

'maybe' (Shamsollahi et al., 2021). They agreed on 16 includes, 69 excludes, and 7 maybes; disagreements occurred for 38 papers (inter-judge agreement = 0.67; Rust & Cooil, 1994), which is acceptable for exploratory review work (Janssens et al., 2008; Tabachnick & Fidell, 2013). Next, the remaining two authors conducted full-text reviews of all 'include', 'maybe' and 'disagreed' articles ($n = 61$). Inter-judge agreement for the full-text screening was 0.72, exceeding the minimum recommended level (Rust & Cooil, 1994). Discrepancies were resolved through discussion, yielding 29 articles for inclusion. During full-text screening, the first author also identified 27 additional papers through reference searching for further assessment. Following

Shamsollahi et al. (2021), we included these papers despite their not meeting the journal quality criteria, as they played a significant role in the studies retained after full-text screening. Applying the same screening procedure resulted in 13 additional articles being included. Thus, 42 articles were retained from the first search round.

The April 2025 update yielded 54 additional articles since the first search (ScienceDirect = 30; Emerald = 2; Scopus = 22). Using the same screening procedure, two co-authors independently assessed abstracts and agreed on 11 include, 29 exclude, and 5 maybe, with 9 disagreements (inter-judge agreement = 0.83). A subsequent full-text review conducted by the first author resulted in 10 articles for inclusion.

Reference searching at this stage did not identify any additional papers for further assessment. Thus, across both search rounds, 52 articles were included in the final review (see Table 1 for the journal quality ratings).

3. What do we know about healthy eating among children?

We adopted the ADO-TCM framework to conduct a framework-based systematic review (Lim et al., 2021). In this framework, Antecedents (A) capture factors shaping food-related pleasure, which influence Decisions (D) (e.g., healthy food choice, intake, portion choice) and subsequent Outcomes (O) (e.g., subjective and objective well-being, and childhood obesity prevention). Fig. 2 summarizes the ADO dimensions identified in the literature to explain how food pleasure can promote children's healthy food choice and consumption.

3.1. Antecedents

Antecedents capture why children do (or do not) engage in pleasurable healthy eating and can shape outcomes directly or indirectly (Paul & Benito, 2018). Consistent with Marty et al. (2018), we distinguish three pleasure dimensions as antecedents: sensory, interpersonal, and psychosocial. During coding, we identified a fourth category, physiological dimensions, capturing bodily states (e.g., hunger, fullness) that systematically shape perceived pleasure. Below, we synthesize the drivers examined within each dimension and their links to children's healthy eating.

3.1.1. Sensory dimensions of healthy food pleasure

The sensory dimension refers to enjoyment derived from the sensory properties of healthy foods. Such foods can generate hedonic well-being by delivering sensory experiences (Hémar-Nicolas & Ezan, 2019), which in turn shape children's liking, willingness to try, and consumption.

Across studies, manufacturers and practitioners can increase pleasure associated with healthy foods through product-related strategies that optimize sensory cues (Batat et al., 2019; Pettigrew, 2016). For instance, interventions can highlight the enjoyment from eating fruits and vegetables by emphasizing sensory properties such as taste, texture, aroma, freshness, and appearance (Albani et al., 2018). Engaging multiple senses during food experiences can also increase children's willingness to try unfamiliar foods (Helland et al., 2021). Given the strong predictive role of hedonic perception in food choice (Alcaire et al., 2021; Marty et al., 2017), we organize sensory antecedents by modality.

3.1.1.1. Taste/flavor. Taste is the dominant factor influencing children's food choice and intake (e.g., Bawajeeh et al., 2020), with taste preferences developing early and remain relatively stable over time (Elliott, 2009). Rigo et al. (2023) varied flavor, food form, and portion size for smoothies and bread and found that flavor was the primary driver of perceived tastiness and choice. These findings underscore the importance of early, positive taste experiences with healthy foods for learning pleasure-health associations. Consistent with this, Schwartz et al. (2013) show that seasoning vegetable increased children's acceptance, while Waddingham et al. (2018) found that when children designed menu items, taste-related properties such as the juiciness of fruits in a salad, were central to their choices. These findings show that taste flavor are a central antecedent of pleasurable healthy eating in children.

3.1.1.2. Smell. Smell (olfaction) is another sensory antecedent, experienced either directly through food or indirectly via the surrounding environment. Our review highlights the influence of ambient food-related scents on children's food choices. However, this was the only study. Biswas and Szocs (2019) find that prolonged exposure to indulgent food scents (e.g., pizza or cookies) reduce children's selection of unhealthy foods, as these scents appeared to satisfy hedonic desire and enhance perceived reward without actual consumption. By contrast, exposure to a healthy scent (e.g., apple) did not produce the same effect. These findings position olfactory pleasure as a subtle sensory antecedent that shape food decisions in non-obvious ways, including the creation of avoidance responses toward unhealthy options.

3.1.1.3. Visual information. Children rely heavily on visual information when identifying and evaluating foods (Letona et al., 2014). In the reviewed studies, visual cues were the most frequently examined sensory antecedent, including intrinsic cues (e.g., color, shape) and extrinsic cues (e.g., plating).

On the intrinsic side, distinct shapes can make healthy foods more appealing. Mothers reported that face-or animal-shaped vegetables increased vegetables' appeal (Schwartz et al., 2013). Color also guides taste expectations. Ezan et al. (2019) found that brightness, saturation, and vividness shape expectations of taste intensity and richness; darker yellowish-beige-brown compotes were perceived as "richer," whereas lighter-colored compotes were associated with bitterness or acidity. Atypically colored vegetables can increase positive taste expectations and encourage tasting, even if post-tasting liking does not differ

Table 1
Quality ranking of reviewed articles.

No	Journal title	Reviewed articles count	Publisher	ISSN	ISSN online	Year inception	Rating ABDC/ABS
1*	American Journal of Health Behavior	1	PNG Publications	1087-3244	1945-7359	1996	
2	Appetite	26	Elsevier	0195-6663	1095-8304	1980	A
3*	Archives of Pediatrics and Adolescent Medicine	1	American Medical Association	1072-4710	1538-3628	1994	
4*	Canadian Journal of Communication	1	UTP Publishing	0705-3657	1499-6642	1974	
5*	European Journal of Clinical Nutrition	1	Springer Nature	0954-3007	1476-5640	1947	
6	Food Quality and Preference	11	Elsevier	0950-3293	1873-6343	1988	A
7*	International Journal of Behavioral Nutrition and Physical Activity	1	BioMed Central	N/A	1479-5868	2004	
8	International Journal of Retail & Distribution Management	3	Emerald Group Publishing	0959-0552	1758-6690	1973	A
9	Journal of Business Research	1	Elsevier	0148-2963	1873-7978	1973	A/3
10*	Journal of Health Communication	1	Taylor & Francis	1081-0730	1087-0415	1996	
11	Journal of Marketing Research	2	Sage Publications	0022-2437	1547-7193	1964	A*/4*
12	Journal of Service Management	1	Emerald Group Publishing	1757-5818	1757-5826	1990	A
13*	PLOS One	1	Public Library of Science	N/A	1932-6203	2006	
14	Psychology and Marketing	1	Wiley-Blackwell Publishing	0742-6046	1520-6793	1984	A/3

* These journals did not meet the selection criteria; however, the relevant articles were identified through the reference searching conducted following Shamsollahi et al. (2021).

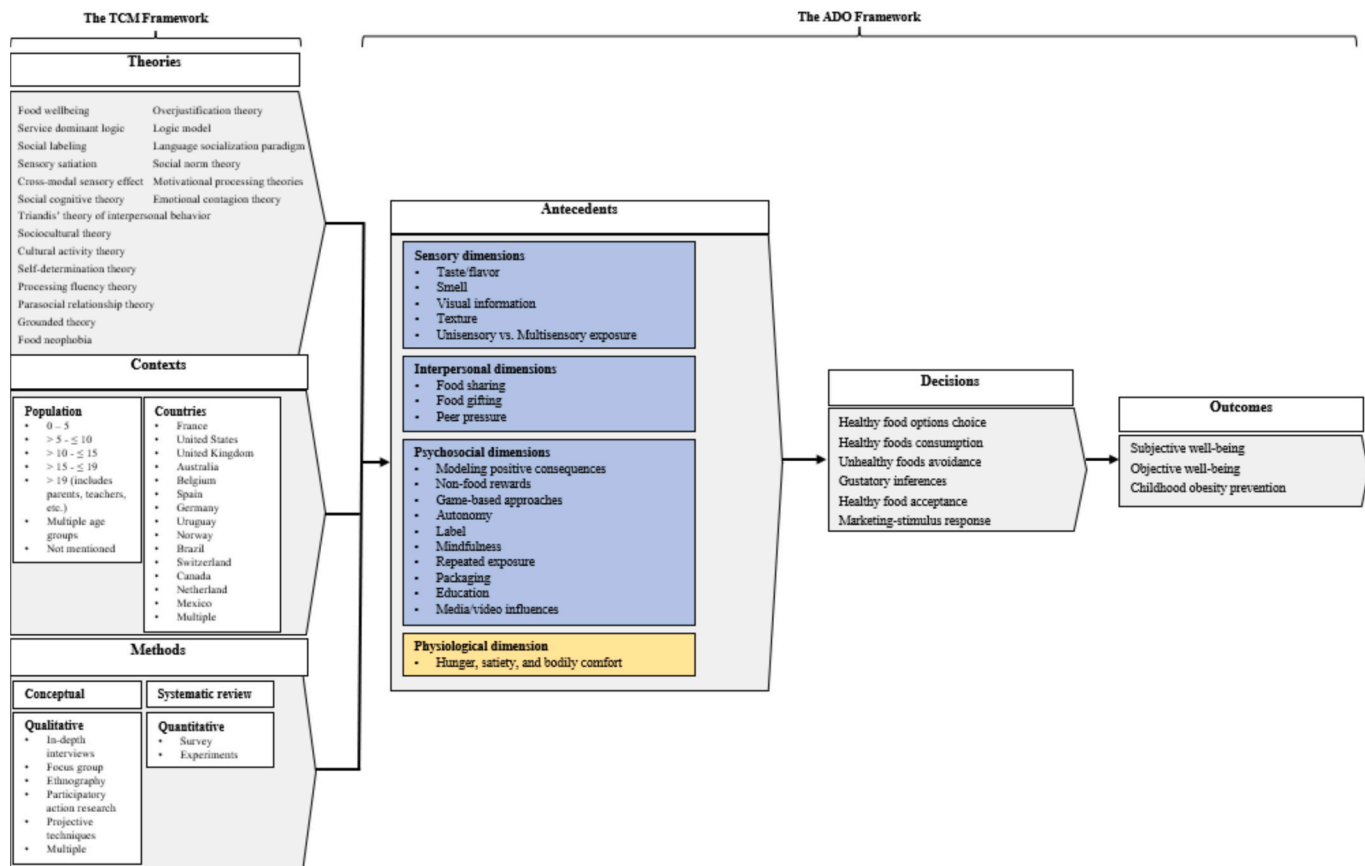


Fig. 2. Overview of the antecedents, decisions, and outcomes of how eating pleasure promotes healthy eating in children (adopted from Lim et al., 2021).

(Poelman & Delahunty, 2011).

Extrinsic cues matter as well. Bezaz and Kacha (2021) found that higher saturation and brightness on an orange-juice package improved children's packaging evaluations and brand attitudes. However, it is important to note that the color on packaging and food better align. Packaging color (extrinsic) reliably increases children's package and brand evaluations when it is more saturated and brighter (and, in this setting, blue-toned) (Bezaz & Kacha, 2021), whereas product color (intrinsic) shapes gustatory expectations (e.g., darker compotes read as richer/less insipid) with effects that depend on product format (e.g., compote vs pouch) (Ezan et al., 2019). Presentation matters as well. Aesthetically pleasing presentation raised willingness to try unfamiliar foods and increased consumption (Maiz et al., 2019), and children consumed more fruit when presented as a visually appealing mix (e.g., a flag-decorated fruit cocktail) (Jansen et al., 2010). Overall, visual cues are fast, effective, child-salient signals that shape gustatory inferences and can facilitate (or hinder) pleasure-based uptake of healthy foods.

3.1.1.4. Texture. Texture, often operationalized as food form, exerts secondary but reliable effects on hedonic responses to healthy foods. Rigo et al. (2023) found that thinner, juice-like smoothies were rated tastier and chosen more often than thicker versions, suggesting lower viscosity increases the hedonic appeal of drinkable healthy options. However, flavor remained the primary determinant of preferences, with texture functioning more as a hedonic nudge than a standalone driver.

3.1.1.5. Unisensory vs. multisensory exposure. Given that eating is inherently multisensory and multisensory environments support learning and food acceptance, Roberts et al. (2022) tested whether familiarization engaging multiple non-taste senses increases immediate vegetable acceptance more than single-modality exposure. Willingness

to taste and amount consumed increased linearly with the number of senses engaged (i.e., sensory accumulation). Multisensory exposure involving two senses (smell and vision) and three senses (smell, touch, and vision) outperformed both control and visual-only conditions, whereas visual-only exposure was insufficient, consistent with the need for repeated exposures to produce robust visual effects. Multisensory familiarization is a strong antecedent because it increases sensory pleasure and supports downstream tasting and consumption.

3.1.2. Interpersonal dimensions of pleasure

Interpersonal dimensions capture how social relationships, interactions, and contexts shape children's enjoyment, choice, and consumption (Marty et al., 2018). Eating with others is central to the development of children's eating habits (Marty et al., 2018) and highlights that pleasure is not solely rooted in individual preferences, but also in shared norms and expectations built through social eating situations.

3.1.2.1. Food sharing. Food sharing is a key source of food pleasure as it offers opportunities to reinforce values and norms and strengthen social ties (Batat et al., 2019). Even in early life, infants can associate pleasure through closeness to their mothers during initial feeding episodes (Nicklaus, 2016). In a school context, Fossgard et al. (2021) found that sharing the "best foods" from lunchboxes (e.g., attractive fruits) symbolized close friendships, demonstrating that the pleasure derived from sharing food can indeed make healthy foods more attractive. Maldoy et al. (2021, p.361) distinguish between simple co-eating (eating at the same time) from "genuine sharing" (e.g., eating from the same bowl, sharing a cookie) and show that images depicting genuine sharing of healthy foods (vs. eating alone) increased pleasure and appeal. However, these findings should be interpreted with caution. Genuine sharing may be positively valued when it is understood as a voluntary and

relational act, but it may not be acceptable across cultural contexts. In settings where food consumption is more individualized, or where norms around hygiene, intimacy, and etiquette discourage eating from shared food items, genuine sharing may be perceived as inappropriate or even rude (Jönsson et al., 2021). As the reviewed articles did not examine these cultural differences, the effectiveness of genuine sharing is likely to depend on culturally specific norms surrounding communality and food sharing.

Another form of sharing involves eating together in groups. Indeed, eating food in social settings involving multiple people is generally more pleasurable for children (Batat et al., 2019; Hémar-Nicolas & Ezan, 2019), whether driven by parents (Kremer-Sadlik & Morgenstern, 2022; Nicklaus, 2016; Rigal et al., 2021) or peers (Waddingham et al., 2018). For example, Maldoy et al. (2021) showed that social contexts affect the appeal of healthy food indirectly via pleasure. In advertising contexts, depictions of gregarious communities elicited the most positive and arousing responses to healthy food ads (Samson & Buijzen, 2021).

3.1.2.2. Food gifting. Food gifting is another interpersonal practice through which children express emotions and strengthen relationships. Fresh fruit in lunchboxes may be gifted to peers to signal friendship or gain positive attention (Fossgard et al., 2021). This act of giving not only strengthens relationships but also provides self-satisfaction, which encourages choosing healthy foods as 'gift-worthy' options (Hémar-Nicolas & Ezan, 2019).

3.1.2.3. Peer pressure. Peer pressure can prompt children to try new foods because peer admiration and acceptance matter (Ensaff et al., 2015). Prior research has often emphasized its negative impact on healthy eating, such as increased consumption of unhealthy foods (e.g., Fitzgerald et al., 2013; Larson et al., 2017). However, a recent systematic review on peer pressure and children's healthy eating shows that peer influence can have both negative and positive effects, highlighting the importance of understanding when it can be harnessed for healthy outcomes (Ragelienė & Grønhoj, 2020). For example, Fossgard et al. (2021) showed that lunchboxes with tasty, fresh fruit (e.g., strawberries, blueberries, grapes) attracted positive attention from classmates, whereas "poor" lunch packs drew negative comments. Such social feedback can support in associating healthy foods with social reward, pleasurable experiences and unhealthy foods with social disapproval, making peer responses a leverage point for pleasurable healthy eating.

3.1.3. Psychosocial dimension of healthy food pleasure

Psychosocial dimensions refer to psychological factors shaping children's cognitive representations and expectations of healthy foods, influencing enjoyment and satisfaction (Marty et al., 2018). Children's eating behaviors are shaped by beliefs, attitudes, and emotions, perceived control, as well as by informational and symbolic cues in their environment. We discuss the effectiveness of various interventions that shape cognitive representations of the pleasure associated with healthy foods.

3.1.3.1. Modeling positive consequences. Modeling has been examined in multiple contexts as modeling by parents, other adults, peers and fictional characters and has been shown to improve healthy food intake (e.g., de Droog et al., 2012; Helland et al., 2021). In a kindergarten program, when adults ate the same foods and expressed enjoyment, children were more willing to try them (Helland et al., 2021). Interestingly, older children (2-year-olds) sometimes followed the example of younger 1-year-olds in trying novel foods, suggesting that younger children can act as role models. Appleton et al. (2019) distinguished between modeling intake (i.e., behavior) and modeling enjoyment, showing that hearing a story that modeled carrot enjoyment (vs. no

modeling enjoyment) increased both carrot liking and intake. Given that liking and consumption are learned motivated behaviors (Bandura, 1986; Capaldi, 1996; Rozin, 1990), modeling pleasure is a strong antecedent.

3.1.3.2. Non-food rewards. Tangible and intangible rewards are common, but neither alone reliably fosters enduring pleasure toward healthy choices (Grubliauskiene et al., 2012; Wardle et al., 2003). However, combining tangible rewards with intangible rewards (e.g., praise) appears more effective. Grubliauskiene et al. (2012) showed that praising children (e.g., clapping and smiling) combined with a tangible reward (e.g., a game) increased children's (5–11 aged) desire to choose healthier options over unhealthy alternatives, even when unhealthy options were available. Similarly, pairing a cartoon character (e.g., Miffy) with sticker rewards increased willingness to taste various vegetables; largely driven by the reward component (de Gooijer et al., 2024). From an antecedent perspective, rewards appear most effective when they increase positivity and social recognition attached to choosing healthy foods, rather than functioning as purely external bribes.

3.1.3.3. Game-based approaches. Developing effective communication strategies for healthy eating requires addressing both functional and hedonic benefits. Adding fun, game-like elements to healthy foods allows children to consider these benefits simultaneously rather than as trade-offs (Mahr et al., 2013). As such, utilizing a game-based approach has been proven to be an effective intrinsic motivator (Chow et al., 2020). Engagement in games brings pleasure to an eating situation which might otherwise be seen as boring or stressful. Overall, effectiveness of game-based approaches, regardless of their types, revealed the favorable effects on healthy food intake, healthy food preference, novel vegetable acceptance as well as variability in food choices (except 1 study; Chow et al., 2020).

3.1.3.4. Autonomy. Children enjoy participating in food decision-making and cooking, particularly when they have meaningful input, which creates a sense of empowerment and food competences for French children (Hémar-Nicolas & Ezan, 2019). van der Horst et al. (2014) found that helping prepare a meal with a parent increased positive affect and dominance, which in turn increased healthy food intake, especially for salads, where involvement was highest. Opportunities to develop feelings of accomplishment are not limited to offline or physical activities. Online platforms that allow children to complete tasks such as growing and harvesting grains and vegetables can similarly promote a sense of agency (Mahr et al., 2013). Autonomy thus operates as a psychosocial antecedent that makes healthy eating feel self-directed and competence-enhancing.

3.1.3.5. Label. Front-of-pack (FOP) labels and other health-related information can shape children's food evaluations, although findings are mixed. Waddingham et al. (2018) found that knowledge of health messages did not automatically translate into healthy consumption. In contrast, Arrúa et al. (2017) showed that label design (e.g., fruit drawings, characters) and FOP nutritional labels influenced choices for both healthy (juice) and unhealthy (wafer cookies) products; FOP warning labels had greater impact than traffic-light system on children's choices of both healthy and unhealthy products. Fruit drawings on the label of wafer cookies increased their appeal, and nutritional claims on juice influenced choices. Cartoon characters had less influence on children's choices than other label features. Overall, labeling shapes cognitive interpretations of health and taste, with hedonic effects contingent on design.

3.1.3.6. Mindfulness. Imagining the taste, smell, and texture of foods is a cognitive act that can influence subsequent choices. In sensory imagery interventions, after imagining multisensory features of hedonic

foods and drink (e.g., brownies and a soft drink), when offered food, children chose smaller portions of unhealthy food (Cornil & Chandon, 2016; Lange et al., 2020). These findings suggest that being mindful of how sensory pleasure of energy-dense foods increases with small portions and declines with larger portions. This demonstrates that being mindful of eating experiences supported by multisensory imagery can shape what moderately hungry (vs. sated or very hungry) non-dieting children choose to consume and highlights the positive role pleasure can play in the consumption experience. Dominguez-Viera et al. (2024) found that a mediation-based stress-reduction program did not significantly increase the initial choice of healthy snacks but did increase switching away from unhealthy to healthy snacks after an initial choice. Together, these studies position mindfulness and can recalibrate pleasure expectations and strengthen self-regulation.

3.1.3.7. Repeated exposure. While acknowledging the importance of pleasure-oriented approaches, Haines et al. (2019) emphasize that enhancing the pleasure of healthy foods also requires repeated exposure to situations where healthy foods are consistently linked to enjoyable experiences. In addition, repeated exposure increases willingness to try foods (Schwartz et al., 2013) and reinforces pleasure from healthy eating (Bellisle, 2009; Waddingham et al., 2018). Haines et al. (2019) further suggest that repeated exposure strengthens positive cognitive associations (e.g., positive thoughts and ideas) with healthy foods, making repeated exposure a core psychosocial antecedent operating through familiarity and learned liking.

3.1.3.8. Packaging. Packaging is a salient cue in children's food evaluations, and fun-associated packaging (e.g., characters) can alter sensory pleasure (Elliott, 2009). Younger children are particularly attracted to cross-merchandising (i.e., Buzz Lightyear, Spiderman, or Polly Pocket) and fun shapes, whereas older children focus more on the overall package (i.e., colors, design, and imagery; Elliott, 2009). Children may still place greater importance on food's own color than on packaging, but they are also drawn to fruit drawings, bright colors, fun tops, characters, and games on the packaging (Ezan et al., 2019). Children may prioritize food color, but are also drawn to fruit drawings, bright colors, characters, and games (Ezan et al., 2019). Dial and Musher-Eizenman (2020) found foods in appealing packaging were rated tastier than plain-packaged or unpackaged foods, and information-rich packaging influenced both health and taste judgments and willingness to try. Character-product congruency matters: children preferred familiar, conceptually congruent combinations (Lapierre et al., 2011), especially when characters resembled product color/shape (de Droog et al., 2012). Even names mattered (e.g., "Healthy Bits" elicited greater enjoyment than "Sugar Bits") (Lapierre et al., 2011). Packaging therefore shapes hedonic and health expectations.

3.1.3.9. Education. School-based programs designed to increase knowledge, attitudes, and intake of healthy foods often incorporate multisensory components and social contexts alongside informational content. Such programs have been found to increase knowledge about vegetables and willingness to try them (e.g., Dahmani et al., 2024; Helland et al., 2021).

Rigal et al. (2021) found that a five-month, home-based sensory education program buffered against declines in vegetable variety observed in control groups, suggesting that pleasure-oriented activities at home can sustain dietary variety. The intervention used interactive, sensory-based activities (e.g., tasting, visual identification, peer discussions) that connected cognitive learning with pleasurable sensory engagement. This indicates that educational interventions, whether provided via formal or informal education, emphasizing curiosity, discovery, and sensory play can make healthy food more enjoyable and act as psychosocial antecedents.

3.1.3.10. Media/video influences. The impact of food advertising via digital media (e.g., YouTube, social media) has grown substantially, and recent research has begun to examine how such advertising influences children's eating. Exposure to a single, brief YouTube-style ad can affect recall: for example, adolescents recalled burger ads more easily than salad ads, although this did not always translate into immediate burger choice (Ares et al., 2023). However, among frequent burger-eating adolescents, exposure to salad ads tended to increase salad choice relative to controls, suggesting that digital video can shift proximal responses, especially when aligned with existing habits. In nursery settings, repeated, TV-style healthy food ads using child-centric creative elements (peers, parents, fun/fantasy, music) increased actual intake of healthy foods when children subsequently faced a healthy-only buffet, while intake decreased in the control group (von Nordheim et al., 2022). This indicates that video content can translate into behavior change when the choice architecture is supportive. As an antecedent, media influences act by making healthy foods more salient, emotionally engaging, and socially normative.

3.1.4. Physiological dimension of healthy food pleasure: Bodily states and physical well-being

Physiological dimensions refer to bodily states and embodied responses that shape how healthy foods are anticipated, experienced, and evaluate, which in turn triggers physiological responses (Bellisle, 2009). In contrast to sensory pleasure, which concerns the perceptual properties of food, the physiological dimension captures how states such as hunger, fullness, satiety, energy, tiredness, and bodily comfort or discomfort can make eating healthy foods feel more or less pleasurable. Although Marty et al. (2018) have not separated this dimension explicitly, our coding suggests that children's bodily experiences can function as antecedents of pleasurable healthy eating.

Food can support short-term physical well-being by providing strength and energy for daily activities (Hémar-Nicolas & Ezan, 2019). Children described a 'proper' lunch as something that made them "feel well and full for the rest of the day" or made them feel ready to go out during the long break (Fossgard et al., 2021, p. 7–8). Conversely, forgetting food or avoiding eating was associated with hunger, tiredness, and negative mood (Fossgard et al., 2021). These accounts suggest that bodily consequences of eating (or not eating) can contribute to the broader pleasure experience. Thus, the physiological dimension should not be understood as pleasure generated by physiological states alone, but as the embodied cognitions through which healthy eating can feel satisfying, comfortable, and enjoyable.

3.1.4.1. Hunger, satiety, and bodily comfort. Food experience involves not only sensory enjoyment during consumption but also bodily states and consequences that shape whether eating feels satisfying, comfortable, and pleasurable (Arnould et al., 2002). Hunger itself is not inherently pleasurable; indeed, excessive hunger can be uncomfortable. However, moderate hunger may increase appetitive readiness and make healthy foods more appealing and enjoyable than when children are already full. In this sense, hunger can be understood as a physiological context derived from a bodily state that shapes how pleasurable healthy foods are likely to feel, rather than as a source of pleasure in itself. Evidence from the reviewed studies suggests that hunger and satiety may shape children's responses to food cues and food offerings. For example, Lange et al. (2020) found that sensory imagery of energy-dense foods led children to choose smaller portions of unhealthy foods, particularly when they were less hungry, suggesting that children's bodily states can influence how they respond to anticipated food consumption. In everyday feeding practice, some mothers reported offering vegetables or previously rejected foods at the start of meals, when children are hungrier (Schwartz et al., 2013). Together, these findings suggest that hunger and satiety may affect the conditions under which foods, including healthy foods, are accepted and experienced positively.

Importantly, physiological states do not generate pleasure in the same way as games, rewards, or sensory cues. Rather, they shape the bodily conditions under which healthy eating can be experienced as satisfying, comfortable, and pleasurable. This highlights the need to understand how naturally occurring bodily states, such as hunger and fullness, shape pleasurable healthy eating.

3.2. Decision

Decisions involve children's behavioral action or inaction around healthy foods that are driven by pleasurable eating experiences. These decisions stem from the antecedents (i.e., key pleasure dimensions) and are a precursor to the outcomes (i.e., children's health and well-being) (Paul & Benito, 2018). Because children (i.e., infants through adolescents between the ages of 6 months to 19 years) often lack full purchasing power or autonomy over consumption, decision making involves multiple agents identified in the literature, from children themselves to parents, teachers, caregivers and other family members, and it is further influenced by retailers and marketers through the design of food experiences. In this review, we code only child decisions directly related to healthy food responses. The review reveals six major categories of decisions that children and others face when encountering pleasurable eating contexts with healthy foods. Five categories relate to food-behavior decisions: healthy food choice, healthy food consumption, unhealthy food avoidance; gustatory inference, and healthy food acceptance. The sixth category captures responses to marketing stimuli.

All six decision categories appeared with similar frequency, except for the sixth, with several studies employing two (e.g., Maiz et al., 2019; Roberts et al., 2022) or even three decisions (e.g., Ares et al., 2023; Lange et al., 2020). The food items used included both healthy and unhealthy options and varied across solid foods (e.g., vegetables and fruits) and beverages (e.g., orange juice). Unhealthy food avoidance is distinct from other decisions as it is used in studies examining how to reduce unhealthy food decisions either using only unhealthy options (e.g., Biswas et al., 2019; Cornil & Chandon, 2016) or both healthy and unhealthy options while focusing on avoidance (e.g., Dominguez-Viera et al., 2024). Healthy food consumption was measured in multiple ways using one or more of the following means, including grams of the healthy food consumed (e.g., Appleton et al., 2019), variety of healthy items consumed (e.g., Rigal et al., 2021), number of healthy items consumed (e.g., Roberts et al., 2022), and total energy (kcal) consumed (e.g., van der Horst et al., 2014), and total weight intake (g) (e.g., Poquet et al., 2022). Healthy food choice covers both actual selection among food options (e.g., Marty et al., 2017) and portion size choice (Lange et al., 2020). Gustatory inference index overall taste perception. While the majority were measured with actual taste tests following the intervention (e.g., Johnson et al., 2007), some studies assessed inferences without tasting, using visual cues (e.g., packaging color, Ezan et al., 2019) or combined attributes (flavor, food form and portion size; e.g., Rigo et al., 2023). Healthy food acceptance captures liking and approaching tendencies, including likelihood of eating (e.g., van der Heijden et al., 2020), their willingness to try/taste (e.g., de Grooijer et al., 2024), and overall liking/attitude toward healthy foods (e.g., Dahmani et al., 2024). Lastly, marketing-stimulus responses capture children's cognitive and evaluative reactions to healthy food marketing (e.g., ad/content recall; brand recognition/recall packaging evaluations; e.g., Ares et al., 2023; Bezaz & Kacha, 2021). It is common for studies to use multiple measures within a category (e.g., number of healthy items consumed and total kcal consumed; van Nordheim et al., 2022).

3.3. Outcomes

A pleasurable eating experience is essential for improving children's health and well-being where the food-pleasure outcome that emerged from the literature includes: (a) subjective well-being (b) objective well-being, and (c) childhood obesity prevention.

A positive outcome for children is the subjective and objective well-being that comes with eating healthy. Adult decisions to allow children to take an active role in food preparation (Hémar-Nicolas & Ezan, 2019), children consuming and learning to appreciate foods that are pleasurable (Dominguez-Viera et al., 2024; Rigal et al., 2021), and sharing a healthy meal with friends and family (Fossgard et al., 2021; Kremer-Sadlik & Morgenstern, 2022; Schwart, 2013) can increase feelings of satisfaction and enjoyment, strengthen relationships, and foster a sense of happiness and community, all of which enhance subjective well-being. Consumption of a healthy diet can also improve children's energy levels and cognitive function, and children showing an understanding of this (i.e., Hémar-Nicolas & Ezan, 2019) and engaging in this type of behavior are examples of how decisions can influence objective well-being.

Another outcome for children is a reduction and prevention in childhood overweight and obesity levels. By deciding to consume a balanced and healthy diet, this can improve children's physical health by reducing risks of chronic diseases such as obesity, diabetes, and heart disease. Adults, caregivers, and schools educating and promoting the pleasures associated with consuming fruits, vegetables, whole grains, and lean proteins can increase desirability of these foods (Jansen et al., 2010; Maiz, 2019; Poelman & Delahunty, 2011; Waddington et al., 2018), and provide children with the necessary nutrients for growth, development, and overall health.

4. How do we know about healthy eating experiences among children?

4.1. Theories

Theories are a means for scholarly advancement. Our review finds several insights for theory. First, this review found that only a limited number of theories have been used to guide pleasurable-eating research (see Table 2). In total, 20 different theories have been applied to healthy eating research among children across 52 articles, with some articles employing more than one theory. Indeed, we note the limited volume of theories, especially given that the earliest articles on healthy eating in this review appeared in 2003 (Wardle et al., 2003) and review articles have been published across several years at the time of writing; i.e., Pettigrew (2016), Nicklaus (2016), Bellisle (2009), Haines et al. (2019), Marty et al. (2018), Chow et al. (2020), Bédard et al. (2021).

Second, this review finds that premier journals remain receptive to research that relies only on articles that did not use theor(ies) in predicting and generating changes in food consumption. This indicates that the current theoretical landscape of healthy eating in children's research in "A*" and "A" journals may have the breadth but not the depth in scholarly insights. The limited range of theories and overreliance on general concepts around healthy eating corresponds to the breadth of antecedents, decisions, and outcomes that were depicted earlier. This shortcoming may be attributed to existing systematic reviews that fail to offer a comprehensive list of theories for future research, which is now resolved through the present review.

Third, from the limited theoretically sound research, food neophobia (characterized by children's rejection of foods that are new or unfamiliar-visually and in terms of taste) was the most popular theory considered in studies on children's healthy eating research. Food neophobia is associated with (anticipated) food displeasure. The other two theories that join food neophobia to make up the top three most-used theories for pleasurable healthy eating in children are grounded theory and food wellbeing. The rest of the theories were used only once.

We believe the lack of theoretical underpinning of the majority of articles is a potential issue that future scholars may encounter as a result of a field unfocused on theory building and analytical rigor. To mitigate this potential problem, we utilized Marty et al.'s (2018) study to distinguish the antecedents of pleasurable eating through three pleasure dimensions - (1) sensory dimensions, (2) interpersonal dimensions, (3)

Table 2
List of theories.

Theory	Research area	Main dimension used	n articles
Food wellbeing	Experiences, Product	Sensory, Interpersonal, Psychosocial	2
Service dominant logic	Experiences	Psychosocial	1
Social labeling	Social relations, Experiences	Psychosocial	1
Sensory satiation	Product	Sensory	1
Cross-modal sensory effect	Product	Sensory	1
Social cognitive theory	Social relations	Psychosocial	1
Triandis' Theory of Interpersonal Behavior	Experiences	Psychosocial	1
Sociocultural theory	Experiences, Social relations	Interpersonal, Physiological	1
Cultural activity theory	Experiences, Social relations	Interpersonal, Physiological	1
Self-determination theory	Experiences	Psychosocial	1
Processing fluency theory	Experiences, Product	Psychosocial	1
Parasocial relationship theory	Experiences, Product	Psychosocial	1
Grounded theory	Experiences, Products	Sensory, Interpersonal, Psychosocial	3
Food neophobia	Experiences, Social relations, Product	Psychosocial	4
Overjustification theory	Experiences	Psychosocial	1
Logic model	Experiences	Psychosocial	1
Language socialization paradigm	Social relations	Interpersonal	1
Social norm theory	Social relations	Interpersonal	1
Motivational processing theories	Social relations	Interpersonal	1
Emotional contagion theory	Social relations	Interpersonal	1
	With theory		22
	Without theory		30
			52

Note: Some articles employed more than 1 theory.

psychosocial dimensions; with an added fourth dimension (4) physiological dimensions that emerged during coding to organize the 19 antecedents of healthy eating in children. This is applied to help future scholars identify suitable theories that resonate with the focus of their research, and to encourage scholars to consider new theories in these areas found in the research – *product*, *social relations*, or *experiences* – to address the shortcomings observed in the reviewed literature (See Table 2).

4.2. Contexts

Contexts relate to the circumstances involved in the investigation (Paul et al., 2017). Our review focuses on population and country (see Table 3). In terms of population, 19.2% of articles focused on children aged $>5\text{--}\leq 10$ years, while 11.5% focused on multiple age groups. A smaller proportion focused on children aged ≤ 5 years (7.7%), and 1.9% each focused on children aged $>10\text{--}\leq 15$ years and $> 15\text{--}\leq 19$ years. Adults, such as mothers and teachers, were examined in 3.8% of studies. The largest share of studies did not report a mean age (34.6%), although most provided an age range. In terms of countries, most studies on children's healthy eating were conducted in France (21.2%) and the United Kingdom (11.5%), followed by the Netherlands (9.6%).

4.3. Methods

Methods explain the nature of empirical evidence that develop

Table 3
Contextual coverage.

Context	n of articles	% of articles	Relevant articles
POPULATION			
Mean Age			
0–5	4	7.7	Johnson et al. (2007); de Gooijer et al. (2024); Roberts et al. (2022); von Nordheim et al. (2022)
$> 5 - \leq 10$	10	19.2	Dial and Musher-Eizenman (2020); Dovey et al. (2011); Jansen et al. (2010); Marty et al. (2017); Bezaz and Kacha (2021); Rigo et al. (2023); Grubliauskiene et al. (2012); Maiz et al. (2019); Mazzonetto and Fiates (2014); Wardle et al. (2003)
$> 10 - \leq 15$	1	1.9	Leech et al. (2014)
$> 15 - \leq 19$	1	1.9	Maldoy et al. (2021)
> 19 (includes parents, teachers)	2	3.8	Schwartz et al. (2013); Helland et al. (2021)
Multiple age groups	6	11.5	Alcaire et al. (2021); Ensaff et al. (2015); van der Heijden et al. (2020); van der Horst et al. (2014); Poquet et al. (2020); Lapierre et al. (2011); Ezan et al. (2019); Biswas and Szocs (2019)
Partially reported	2	3.8	Mahr et al. (2013); Elliott (2009); Ares et al. (2023); Dahmni et al. (2024); Dominguez-Viera et al. (2024); Hémar-Nicolas and Ezan (2019); Appleton et al. (2019); Cornil and Chandon (2016); Lange et al. (2020); Waddingham et al. (2018); Albani et al. (2018); Fossgard et al. (2021); Rigal et al. (2021); Arrúa et al. (2017); de Droog et al. (2012); Poelman and Delahunty (2011); Kremer-Sadlik et al. (2022); Samson et al. (2021);
Not reported	18	34.6	
COUNTRIES			
France	11	21.2	Ezan et al. (2019); Cornil and Chandon (2016); Poquet et al. (2020); Marty et al. (2017); Schwartz et al. (2013); Rigal et al. (2021); Hémar-Nicolas and Ezan (2019); Dahmni et al. (2024); Kremer-Sadlik et al. (2022); Lange et al. (2020); Bezaz and Kacha (2021)
United States	4	7.7	Johnson et al. (2007); Lapierre et al. (2011); Biswas and Szocs (2019); Dial and Musher-Eizenman (2020); Albani et al. (2018); Ensaff et al. (2015); Dovey et al. (2011); Wardle et al. (2003); Roberts et al. (2022); Appleton et al. (2019)
United Kingdom	6	11.5	Waddingham et al. (2018); Leech et al. (2014); Poelman and Delahunty (2011); Rigo et al. (2023)
Australia	4	7.7	Grubliauskiene et al. (2012); Maldoy et al. (2021)
Belgium	2	3.8	Maiz et al. (2019)
Spain	1	1.9	von Nordheim et al. (2022)
Germany	1	1.9	Alcaire et al. (2021); Arrúa et al. (2017); Ares et al. (2023)
Uruguay	3	5.8	Fossgard et al. (2021); Helland et al. (2021)
Norway	2	3.8	Mazzonetto and Fiates (2014)
Brazil	1	1.9	van der Horst et al. (2014)
Switzerland	1	1.9	Elliott (2009)
Canada	1	1.9	Mahr et al. (2013); van der Heijden (2020); de Droog et al. (2012); Samson et al. (2021); de Gooijer et al. (2024)
Netherlands	5	9.6	

(continued on next page)

Table 3 (continued)

Context	n of articles	% of articles	Relevant articles
Mexico	1	1.9	Dominguez-Viera et al. (2024)
Multiple (Netherlands, Belgium)	1	1.9	Jansen et al. (2010)

rigorous investigations (Paul et al., 2017). The majority of articles reviewed reported multiple studies each; although the number of studies reported per article ranged from one to five. Further, in the same article, different research methods are frequently reported (e.g., interviews and focus groups). This review considers one major attribute of methods that characterize the 52 articles under study: the research approach.

We identify four approaches in studies of children's healthy eating: conceptual, systematic reviews, qualitative (e.g., in-depth interviews, focus groups, ethnography, participatory action research, projective techniques), and quantitative (e.g., surveys, experiments; between-subjects, within-subjects, and mixed designs) (see Table 4). Fifty-eight percent of the articles in the review employed experiments. Among these, between-subjects designs were most common, followed by mixed designs and within-subjects designs. Relative to within-subjects designs, between-subjects designs avoid carryover and fatigue (Charness et al., 2012), risks that are heightened in child samples given their susceptibility to external influences and shorter attention spans, making the between-subjects approach more appropriate here. Within the between-subjects set, field experiments were most frequent, followed by quasi-experiments and laboratory experiments. Field experiments enhance external validity by observing behavior in natural settings (Baldassarri & Abascal, 2017). At the same time, laboratory experiments remain valuable for isolating mechanisms under controlled conditions and increasing internal validity, by abstracting contextual complexities (Sawyer et al., 1979). Mixed (between $\times$ within) designs offer a pragmatic compromise: they place manipulation(s) prone to sensitization between subjects while leveraging within-subject comparisons to control individual differences and improve power (Charness et al., 2012). Only two articles used survey methods (one cross-sectional; one combining cross-sectional and longitudinal components). Because surveys can deliver breadth and population coverage at relatively low cost (Jones et al., 2013), they are useful as follow-ups to experiments or qualitative studies to assess generalizability and boundary conditions.

Twelve articles pursued a qualitative approach, with multi-method approaches (interviews, focus groups, projective techniques) and focus groups being equally the most preferred method to collect qualitative data. Notably, there was limited use of ethnography, participatory action research, and projective techniques overall, suggesting underutilization of diverse qualitative artefacts that could enrich interpretations of the symbolic and relational aspects of children's eating experiences. Finally, conceptual, and systematic reviews were least used, which in turn, corroborates with the lack of depth in knowledge of the phenomenon of children's healthy eating that we uncovered and encourage future research to pursue previously. Most importantly, while there are some food pleasure scales (e.g., Hyldelund et al., 2024), more refinement is needed as there is little focus on adapting these scales for children.

5. Where we should be heading: Suggestions for future research directions

Below, we outline suggestions for future research. Initially, we examine them through the lens of each pleasure dimension. Then, we explore potential avenues to achieve substantial advancements in theoretical innovation, contextual relevance, and methodological precision in conducting research aiming to understand the link between pleasure and healthy eating among children.

Table 4
Research approach.

Method	n of articles	Relevant articles
CONCEPTUAL		
Conceptual analysis	1	Batat et al. (2019)
QUALITATIVE		
In-depth interviews	2	Helland et al. (2021); Albani et al. (2018)
Focus groups	3	Elliott (2009); Mazzonetto and Fiates (2014); Hémar-Nicolas and Ezan (2019)
Ethnography	1	Kremer-Sadlik et al. (2022)
Participatory action research	1	Waddingham et al. (2018)
Projective techniques	2	Alcaire et al. (2021); Fossgard et al. (2021).
Multiple approaches (e.g., interviews, focus groups, projective techniques)	3	Schwartz et al. (2013); Ensaff et al. (2015); Mahr et al. (2013)
QUANTITATIVE		
Survey		
Cross-sectional design	1	van der Heijden et al. (2020).
Cross-sectional design and longitudinal design	1	Leech et al. (2014)
Experimental		
Between subject experiments		
Field experiment	10	Arrúa et al. (2017); Biswas and Szocs (2019); Malloy et al. (2021); Ares et al. (2023); Cornil and Chandon (2016); Lapiere et al. (2011); Grubliauskienė et al. (2012); Maiz et al. (2019); Roberts et al. (2022); Dominguez-Viera et al. (2024)
Quasi-experimental design	2	Johnson et al. (2007); van der Horst et al. (2014)
Laboratory	1	Marty et al. (2017)
Within subject experiments		
Field experiment	3	de Droog et al. (2012); Dial and Musher-Eizenman (2020); Bezaz and Kacha (2021)
Laboratory	3	Poquet et al. (2020); Poelman and Delahunty (2011); Rigo et al. (2023)
Mixed between and within subjects	11	Ezan et al. (2019); Appleton et al. (2019); Lange et al. (2020); Rigal et al. (2021); Dovey et al. (2011); Jansen et al. (2010); Wardle et al. (2003); Samson et al. (2021); von Nordheim et al. (2022); de Gooijer et al. (2024); Dahmni et al. (2024); Bédard et al. (2021); Chow et al. (2020); Haines et al. (2019); Marty et al. (2018); Pettigrew (2016); Bellisle (2009); Nicklaus (2016)
REVIEW PAPERS	7	

5.1. Future research in relation to each pleasurable healthy eating dimensions

5.1.1. Sensory dimensions

Although prior work suggests that enjoyment of healthy foods can be increased by drawing attention to sensory experience and/or emphasizing sensory properties, several crucial areas remain underexplored. One largely overlooked area concerns ambience, including lighting, sound, smell, temperature, music, and surrounding visual cues, which may shape how pleasurable healthy eating feels. While prior work highlights the role of ambient scent in food choice (Biswas & Szocs, 2019a), other atmospheric cues, such as music, background noise, thermal comfort, imagery, lighting, and environmental color, warrant systematic investigation. For example, healthier soundtracks (e.g., nature-related sounds) and quieter environments influence healthy food choices among adults (Biswas et al., 2019; Peng-Li et al., 2021). An important next step is to test whether comparable soundscapes can

increase children's experienced pleasure from healthy foods, and whether such environments are most effective in early childhood centers, schools, or homes. Another underexplored area is the sensory property of smell. In our review, one study explored ambient food-related scents (e.g., Biswas & Szocs, 2019), but little is known about how smells arising directly from healthy foods shape children's pleasure in consuming them. Can smells become conditioned cues for pleasure, helping children form positive pleasure-health associations rather than defaulting to the belief that "healthy = less tasty"?

In addition, cross-modal sensory research suggests that sound can be deliberately paired with taste/flavor to alter the tasting experience ("sonic seasoning"; Spence et al., 2021). High-pitched sounds, for instance, are consistently associated with sweetness (Crisinel & Spence, 2010). Because children tend to prefer sweet and fatty tastes (Sobek et al., 2020), sonically enhancing perceived sweetness may be a promising route for increasing the appeal of comparatively bland healthy foods. This can be tested by manipulating sound properties (e.g., volume, pitch, genre, tempo; musical vs non-musical cues) while children eat, and evaluating downstream effects on perceived taste, enjoyment, and intake. Practically, playlists could be "seasoned" to amplify specific flavor notes and make healthier foods feel more indulgent without changing their nutritional profile.

Visual presentation is another promising lever. Prior research shows that visually appealing presentation increases food acceptance (Jansen et al., 2010; Maiz et al., 2019), but key design parameters remain unclear. Future work could examine whether color variety on the plate, food separation versus mixing, height/stacking and set size increase attractiveness and anticipated pleasure of healthier foods. Building on evidence that infants as young as five months show stronger preferences for larger sets of objects (Cohen & Marks, 2002), that 10–12 month-old infants prefer containers with more crackers (Feigenson et al., 2002), and that young children prefer and select foods presented in larger sets (Faralla et al., 2023), the abundance hypothesis raises an important question: could presenting healthier foods in larger quantities or higher piles than less healthy foods make them seem more attractive, pleasurable, and desirable, thereby encouraging healthier choices?

Finally, research on color has primarily focused on food color and packaging (Ezan et al., 2019; Elliot, 2009), but color effects extend to the broader environment (room color, lighting) and to tableware (plates, cups, cutlery). Given that warm colors can stimulate pleasure (Cheng et al., 2009), and pinkish-red hues are associated with sweetness (Spence et al., 2021), future research could examine whether warm-colored (specifically, pinkish-red) cutlery, drinking vessels, lunch boxes, or crockery enhance perceived sweetness and enjoyment of healthier foods among children. More broadly, because the literature remains disproportionately visual, incorporating non-visual modalities, especially touch (e.g., texture, weight, temperature of containers and utensils), may uncover overlooked pathways through which healthy eating becomes more pleasurable.

5.1.2. Interpersonal dimensions

Our review advances understanding of how social interactions, such as food sharing, gifting, and peer influence, can encourage healthier food consumption among children. However, we still know relatively little about how the mere presence of others shapes pleasure during eating and, in turn, healthy food choice and intake. Social impact theory (Latané, 1981) offers a useful lens here: individuals can be influenced by the real, implied, or imagined presence of other people (Argo et al., 2005). Future research could examine how core social-impact features, such as the number of others present, their perceived salience (e.g., visibility/attention), closeness (e.g., family vs. peers), and importance in the moment, shape eating pleasure and consequently healthy choices and consumption.

Our review also suggests that frequent family dinners and children's involvement in food preparation can increase meal enjoyment, potentially reinforcing a virtuous cycle of more family meals and more

engagement in preparation. Yet effects may differ across subgroups. For example, Leech et al. (2014) found that family meals strengthened family ties but related differently to boys' versus girls' (aged 10–12) healthy eating patterns, with benefits more evident for boys. This finding warrants deeper investigation into why this gender difference emerges (e.g., differences in mealtime dynamics, autonomy, conversation topics, or affective tone) and how pleasurable aspects of shared meals could be designed to support girls' healthy eating as well.

Finally, the beneficial role of peer influence could be leveraged more directly in social marketing campaigns that emphasize norms. Drawing on social norms insights (e.g., Burchell et al., 2013), future studies could test how norm messages that explicitly connect healthy foods to enjoyment (rather than obligation) shape children's preferences and choices, and whether norm effects depend on who conveys the norm (friends, classmates, siblings, teachers) and the social setting in which it is delivered.

5.1.3. Psychosocial dimension

Research on psychosocial drivers highlights the influence of modeling, rewards, game-based approaches, labeling and colorful packaging, and empowering children through cooking alone or with family/friends. A key implication is that intervention effects may vary across development stages because the psychological processes through which these interventions operate, such as enjoyment, reinforcement, attention to food-related cues, and autonomy-supportive choice, may become more or less salient as children develop. Given that game-based approaches can generate enjoyable experiences (e.g., Chow et al., 2020), future work should move beyond demonstrating effectiveness to identify which game types and which design elements (e.g., narrative, feedback, cooperation vs competition, challenge level) most effectively promote healthy choice and intake at different developmental stages.

Rewards, whether tangible or intangible such as praise, can also increase enjoyment and promote healthier choices, but evidence appears uneven across age groups. Prior work has emphasized preschoolers, with comparatively less attention to school-aged children (Grubliauskienė et al., 2012). Because children at different developmental stages may value different rewards, future research should map which reward types (e.g., social recognition, tokens, privileges) most effectively increase liking and consumption of healthy foods, and whether offline (e.g., stickers) and online rewards (e.g., badges) operate through similar pleasure-based mechanisms.

Food labels and packaging cues show mixed effects, suggesting a need for more developmentally calibrated designs (e.g., logos, colors, characters) that enhance attention and enjoyment without undermining credibility. Beyond communication cues, food versatility, which is ease of eating and customization, may support pleasure by reducing effort and increasing fit with individual tastes (Waddingham et al., 2018). Consistent with evidence that children often prefer smaller, more convenient portions (Liem & Zandstra, 2009; Wansink & van Ittersum, 2013), future studies should examine other versatility features, including autonomy-supportive choice architectures (e.g., allowing children to choose toppings for a salad) as a route to pleasurable and sustained healthy eating.

5.1.4. Physiological dimension

Most studies that measure hunger treat it primarily as a confound that may mask intervention effects on pleasurable healthy consumption (e.g., Fossgard et al., 2021; Lange et al., 2020). Yet hunger itself is plausibly central to pleasure: when people are hungry, food often tastes better and eating can feel more rewarding (Fu et al., 2019). Existing work has typically relied on explicit self-reports of hunger, which may be imprecise, especially with children. Future research could strengthen measurement by incorporating physiological indicators (e.g., blood sugar levels) and neurophysiological approaches (e.g., fMRI) to more accurately capture hunger-related states and test how they interact with interventions targeting healthy food choice and intake.

In addition, future research could examine how hunger-based insights translate into realistic settings such as homes and school lunches, where hunger may carry different meanings and constraints. Even mild hunger might be perceived negatively depending on children's socioeconomic circumstances or geographic context. In settings where food insecurity is common, hunger may be tightly linked to negative emotion and scarcity concerns, potentially pushing children toward any available option, including less healthy foods. For this reason, hunger-related interventions should be evaluated for cultural and contextual appropriateness before being recommended.

5.2. Future research for advancing theoretical novelty, contextual relevance and methodological rigor

5.2.1. Theory novelty

Considering the dimensions (sensory, psychosocial, interpersonal, physiological) presented herein, future work can build theoretical novelty by linking these dimensions to the identified research areas in Table 2—product, experiences, and social relations. For instance, for psychological and social-related antecedents (e.g., psychosocial, or interpersonal dimensions), practice theories may be particularly useful for explaining how pleasure-eating decisions are embedded in everyday routines and shaped by social interactions such as sharing, social pressure, and food gifting.

Our review also indicates that product-related (sensory) and physical (physiological) antecedents can enhance children's enjoyment of healthy foods (e.g., Batat, 2019; Pettigrew, 2016). In a climate where children's senses are continuously being engaged through physical kinesthetic experiences (e.g., experiences at retail spaces, supermarkets, malls) and through digitally mediated sensory experiences (e.g., Autonomous Sensory Meridian Responses (ASMR) content on social media like TikTok), product-related antecedents may have even greater importance for shaping evolving pleasures in healthy food consumption. Yet this insight requires critical scrutiny, as the relationship between digital sensory engagement and healthy eating is neither linear nor inherently beneficial. We encourage future research to apply emotion theories to examine the affective responses that arise when children's senses are engaged through digital and physical channels, and to test whether such embodied affective responses can be harnessed to strengthen pleasure in healthy food experiences. While foundational emotion theories (e.g., appraisal theory, Lazarus, 1991) were developed primarily in offline controlled environments and with adults, directly applying these frameworks to children's digitally mediated food experiences requires careful adaptation. Children's affective responses triggered by digital stimuli may operate through mechanisms that existing emotion theories do not adequately capture, not least because children's emotional and cognitive processing differs substantially from that of adults. Triggering an embodied affective response that can be shaped by digital spaces (YouTube, Tiktok) and their technological affordances can nonetheless create pleasurable sensations and potential enjoyment in the food experience. As more technology is embraced in schools and homes, and keeps people connected (e.g., messaging applications), we expect that children's senses will be heavily engaged in different ways via technological advancements and innovations. For instance, adolescent peer influence in social media environments varies in its level of impacts from positive (healthy eating) to negative eating dynamic eating behaviors (eating disorders) (Chung et al., 2021). The parasocial relationships children form with social media content creators and the platforms they use (Hoffner & Bond, 2022) may mediate or moderate how sensory food content is emotionally processed. These dynamics deserve further investigation. Assemblage thinking (DeLanda, 2016) may be especially valuable for theorizing how socio-technical elements combine and reconfigure to shape pleasurable food experiences as environments and technologies evolve.

5.2.2. Contextual relevance

Most empirical studies on pleasure in healthy eating are concentrated in American and European contexts. Healthy eating research remains under-represented in developing regions (e.g., parts of Africa and Asia), where replication and extension are needed. Because sensory, interpersonal, psychosocial, and physiological antecedents are likely shaped by cultural norms, future work should examine how pleasure is socially and culturally produced, not merely individually experienced—consistent with Marty et al. (2018). We encourage future research to study collective-oriented cultures and how they experience food, how they learn what is healthy, and what is pleasurable. These may moderate or intervene with the effects of antecedents on decisions to choose healthy food options, consume healthy foods, avoid unhealthy foods, and healthy food acceptance. In addition, research with a cross-cultural angle is critical for establishing the validity and generalizability of theories, concepts, and intervention strategies. Although the proposed interventions may offer useful directions for making healthy eating more pleasurable for children, they should not be assumed to be universally applicable across cultural settings. Children's food pleasure and responses to healthy foods are likely shaped by culturally embedded food norms and broader meanings attached to health and pleasure. For example, interventions encouraging autonomy or playful engagement with healthy foods may be received differently where children's food choices are more strongly guided by parental authority or culturally specific ideas about appropriate eating. Future research should therefore examine whether and how pleasure-oriented healthy eating interventions can be culturally adapted, and whether they operate similarly across different cultural and ethnic groups. Cross-cultural comparative studies would help identify the boundary conditions of these interventions and distinguish broadly generalizable components from those requiring local adaption.

Additionally, the literature focuses disproportionately on children aged 5–10, leaving gaps at earlier and later developmental stages. Future research should examine (a) infancy and early childhood (6 months to 5 years), when food learning is rapid, and (b) adolescence (16–18 years), when interpersonal and psychosocial influences may intensify. Notably, a major shift in food-related learning occurs around age 2. Before this point, infants are often more open to trying diverse foods (Paroche et al., 2017), and exposure to varied flavors in the first two years can increase later acceptance of new foods (Butt et al., 2004). Texture acceptance also depends on developmental readiness and prior exposure (Butt et al., 2004). Consequently, the period from the introduction of solid foods (typically around 6 months) up to the age of 2 is a crucial period for nurturing an appreciation for healthier foods. Nevertheless, our current understanding of these developmental stages and age groups, along with their reactions to enjoyable food experiences as catalysts for healthier food choices, remain limited.

5.2.3. Methodological rigor

Although the reviewed literature uses a range of methods, methodological advances are still needed to generate richer, more rigorous insights into pleasure-based healthy eating. As this field matures, more field experiments and naturalistic designs are necessary to test whether observed effects can be generalized to everyday contexts (e.g., schools, homes, lunch settings). Within qualitative work, interviews and focus groups dominate, suggesting limited diversity in data sources; approaches such as ethnography and netnography could broaden what is observable about children's lived experiences and food practices.

As new phenomena emerge (e.g., digital influencers shaping children's food consumption), the field needs more interpretive methodologies that enable an in-depth and meaning-based understanding of the subject. For example, combining ethnographic fieldwork in schools or homes with methods that elicit tacit associations (e.g., ZMET; Zaltman & Coulter, 1995) may uncover mechanisms that are difficult to detect with surveys and lab experiments alone. Similarly, sensory anthropology (i.e., the study of sociocultural responses to sensory stimuli) that is

grounded in the concept of embodiment can uncover different insights into what traditional surveys, interviews, and experiments can offer (Scott & Uncles, 2018). Future researchers can apply this sensorial approach to ethnographic studies to generate multi-sensory data about food consumption experiences among children. To elicit deeper insights, visual methods can be applied such as videography (within ethical limits) to study the human and non-human factors present in food consumption experiences.

6. Limitations

Notwithstanding the contributions of this review, several methodological limitations are present. For the database search, we considered only English-language, peer-reviewed papers published in journals ranked A* or A in ABDC Journal Quality List, or 4*, 4, or 3 in the ABS Academic Journal Guide, and indexed in the four selected databases. Although additional relevant papers outside these journal-ranking criteria were identified through reference searching during full-text screening, our database search strategy may have excluded relevant studies published in other journals. This approach is consistent with the review's aim of synthesizing insights from journals typically associated with high levels of novelty and methodological rigor; however, we acknowledge that relevant insights may also exist in journals outside the selected rankings and databases. While future research may consider soliciting insights from alternative sources not covered here, it is recommended that alternative measures of quality are used (e.g., customized index of research quality, disclosure and appropriateness of methods, steps to mitigate bias) to ensure that the review findings reflect accurate contributions of knowledge. Lastly, this review focused on studies explicitly concerned with pleasure, enjoyment, healthy eating, and children. Future research could adopt broader search terms to develop a more comprehensive understanding of children's pleasurable experiences of healthy eating.

7. Conclusion

This framework-based systematic review extends Marty et al.'s (2018) discussion of pleasure dimensions of healthy foods that children associate with when making healthy food choices and consumption. We categorized the various interventions that have been tested in prior research based on three existing pleasure dimensions by Marty et al. (2018) and one new dimension emergent from this review in an organized framework and provided our recommendations on how the interventions that are found to be effective could be adapted in various ways. In addition, topics for future research of each dimension were proposed. Our work contributes to support and further develop the notion that experiencing pleasure from eating healthy foods could be a promising approach, thus providing insight into how to effectively promote children to build, manage and sustain healthy eating habits.

CRediT authorship contribution statement

Euejung Hwang: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Megan Phillips:** Writing – review & editing, Writing – original draft, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Marian Makkar:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Joya Kemper:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

During the final revision stage, the author(s) used ChatGPT to refine

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

No data was used for the research described in the article.

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