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A Systematic Review of Food Preference Assessments for Children With Pediatric Feeding Disorders: A Need for Modifications and Technological Descriptions

Denise Pichardo
Kennedy Krieger Institute, Baltimore, Maryland

Kathleen Franke and Hallie M. Smith
Kennedy Krieger Institute, Baltimore, Maryland, and Johns Hopkins University School of Medicine

Laura V. Suarez
Project Brilliance, Boca Raton, Florida

Alison M. Kozlowski
Kennedy Krieger Institute, Baltimore, Maryland, and Johns Hopkins University School of Medicine

Food preference assessments have been used in the assessment and treatment of pediatric feeding disorders for a variety of reasons. However, descriptions of food preference assessments in the general literature were originally implemented with children without feeding problems, and therefore may require clarifications and modifications when used with children who exhibit inappropriate mealtime behavior when foods are presented. We reviewed studies published in peer-reviewed journals to identify current descriptions for food preference assessments with children who have feeding disorders. Overall, we found that clear technological descriptions of procedures used were generally absent. As a result, we discuss the importance of, and need for, refining operational definitions and technological descriptions of food preference assessments in the feeding literature, as well as suggestions on how to do so.

Keywords: food preference assessment, food refusal, inappropriate mealtime behavior, pediatric feeding disorders, preference assessment

A feeding disorder is identified when a child's eating and drinking routine results in growth difficulties, nutritional deficiencies, dependence on enteral feeds or oral nutritional supplements, or interference with psychosocial functioning, and it is not solely attributable to a medical condition, explained by another disorder, or related to lack of resources or cultural practice (American Psychiatric Association, 2013).[1] Feeding disorders can occur in as many as 45% of typically developing children and up to 80% of children with disabilities (Williams, Gibbons, & Schreck, 2005). Presentation of a feeding disorder can include total food and liquid refusal with reliance on enteral feeds, liquid dependency, and food selectivity consisting of only eating certain foods dependent on brand,

Denise Pichardo, Department of Behavioral Psychology, Kennedy Krieger Institute, Baltimore, Maryland; Kathleen Franke and Hallie M. Smith, Department of Behavioral Psychology, Kennedy Krieger Institute, and Department of Pediatrics, Johns Hopkins University School of Medicine; Laura V. Suarez, Project Brilliance, Boca Raton, Florida; Alison M. Kozlowski, Department of Behavioral Psychology, Kennedy Krieger Institute, and Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine.

Kathleen Franke is now at The Unumb Center for Neurodevelopment in Columbia, South Carolina. Hallie M. Smith is now at Department of Educational Psychology, Counseling, and Foundations, Mississippi State University.

Correspondence concerning this article should be addressed to Alison M. Kozlowski, Department of Behavioral Psychology, Kennedy Krieger Institute, 707 North Broadway, 2nd Floor, Baltimore, MD 21205. E-mail: Kozlowski@kennedykrieger.org

[1] Of note, while this disorder is now labeled as avoidant/restrictive food intake disorder (ARFID) in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM–5*; American Psychiatric Association, 2013), it was often not referred to as such by authors in the articles contained within this systematic review.

color, texture, or type (Peterson, Ibañez, Kirkwood, Crowley, & Piazza, 2018). Children with feeding disorders often present with problem behavior during mealtimes, frequently referred to as inappropriate mealtime behavior, when foods or drinks are presented that are not part of the child's typical mealtime routine. Some topographies of inappropriate mealtime behavior include head turns, batting at or blocking the spoon, and throwing food or utensils (Piazza, Patel, Gulotta, Sevin, & Layer, 2003). Behavioral interventions are the most empirically supported treatments for feeding disorders or problems (Sharp, Volkert, Scahill, McCracken, & McElhanon, 2016), with escape extinction and differential reinforcement of alternative behavior documented as well-established behavioral interventions (Volkert & Piazza, 2012).

In the literature describing the behavioral assessment and treatment of pediatric feeding disorders, food preference assessments may serve to inform treatment decisions. Researchers have reported that these assessments have been used during the evaluation and treatment of feeding disorders to identify nonpreferred foods to include in functional analyses of food refusal (e.g., González, Rubio, & Taylor, 2014), nonpreferred foods to target during treatment and generalization (e.g., Borrero, Schlereth, Rubio, & Taylor, 2013; Najdowski, Wallace, Doney, & Ghezzi, 2003; Rubio, Borrero, & Taylor, 2015), preferred foods to use to increase consumption of nonpreferred foods (e.g., Ahearn, 2003; Penrod, Gardella, & Fernand, 2012), and nonpreferred foods to use as avoidance foods (e.g., Vaz, Volkert, & Piazza, 2011). Thus, food preference assessments can provide useful information that assists in the treatment of feeding disorders.

Several systematic methods of conducting preference assessments exist in the literature (see Kang et al., 2013 for an extensive review), and the clear definitions and descriptions provided by the authors has allowed for the replication of these procedures. However, it is important to note that these procedures were originally implemented with children without feeding disorders, and therefore these procedures may require some clarifications and modifications when conducted with children who exhibit inappropriate mealtime behavior. Food preference assessments conducted with children with feeding disorders may prove to be more complex because many times food is not reinforcing for that individual, and eating is a nonpreferred activity that may result in problem behavior. For example, Kunkel, Taylor, Kozlowski, and González (2018) conducted food preference assessments with children with feeding disorders and reported that a hierarchy of preference was not determined because the participants avoided the foods or consumption was not observed during the food preference assessment; therefore, additional assessments were necessary. Connie and Vollmer (2019) assessed preferences for edible and leisure stimuli with children with autism spectrum disorder of which four participants had a reported history of food selectivity. The preference assessment results for these four participants were different than their peers in that they did not consume some of the edibles after making a selection. These types of results are likely similar to what might be observed with many children with feeding disorders because the food preference assessment may be conducted before an effective treatment has been identified to help guide the intervention. Understanding that children with feeding disorders may respond differently when asked to make choices about foods is important because assessments directed at obtaining food preference information may need to be modified with these individuals. In the current review, we aim to discuss the current descriptions of food preference assessments in the feeding literature and provide suggestions on how to refine operational definitions and technological descriptions to better provide information to inform feeding interventions and allow for replication.

Method

Search Procedure

This systematic review was conducted according to PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines. Articles published in peer-reviewed journals including food preference assessments conducted with children who had feeding disorders were identified through a search of Google Scholar and PsycINFO, and specific journals (i.e., *Journal of Applied Behavior Analysis* and *Behavioral Interventions*). The search was conducted using the combined

search terms "food selectivity" and "preference assessment," "inappropriate mealtime behavior" and "preference assessment," "feeding problem" and "preference assessment," "feeding disorder" and "preference assessment," and "food refusal" and "preference assessment." The search yielded 876 articles. Following removal of duplicate articles, 475 articles were identified as potentially eligible articles. Of these, 437 were excluded according to the inclusion and exclusion criteria below. As a result, 38 articles were included in this systematic review; these articles are marked with an asterisk in the Reference section. Please see Figure 1 below for a flow diagram demonstrating the number of articles considered at each stage of the search process.

Inclusion and Exclusion Criteria

Articles were included if (a) one or more participant was diagnosed with a feeding disorder or feeding problems as noted in the article; (b) researchers implemented a food preference assessment; and (c) authors mentioned the food preference assessment in the method section of the article. An article was excluded if it was (a) a review article; (b) not peer reviewed; or (c) not published in English. The first and second author independently identified articles using the same search terms in the same search engines and journals, screened those articles for eligibility criteria, and reached consensus on final article inclusion. There were three disagreements, which were resolved by the first and second author reviewing the inclusion and exclusion criteria and rereviewing the articles to determine eligibility criteria.

Data Extraction

After all articles were screened, the 38 included articles were divided among the first four authors. Each author acted as an independent coder and extracted data from the articles using a manualized coding system developed by the first author to remove subjectivity in the interpretation of articles. For each article, the coders extracted data for 19 variables, which are listed and defined below. For each variable, the coders documented "not reported" if the information was not stated in the article. For Items 15 through 19, the manualized coding system prompted coders to extract direct quotes from the article in order to decrease subjectivity in these variables.

1. Number of participants.
2. Sex of participant(s).
3. Age range of participant(s) in years.
4. Primary feeding concern: the primary reason that participant(s) presented for

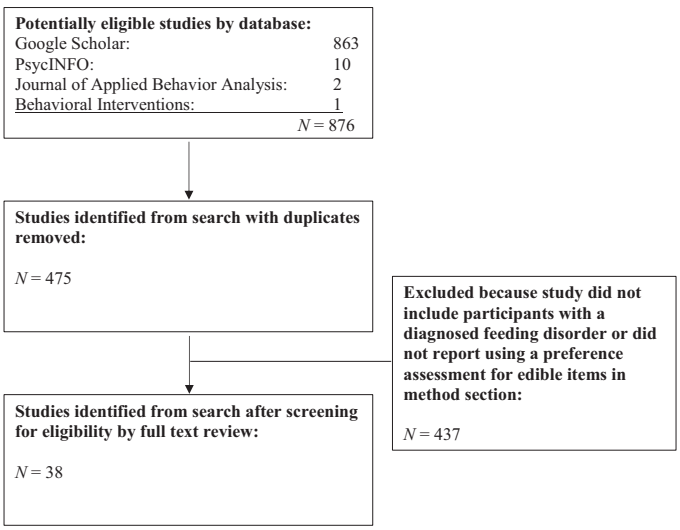

Figure 1. Flow chart demonstrating the number of articles considered at each stage of the search process.

treatment to address feeding. For example, an article would qualify for inclusion if the description of the participant noted that they demonstrated significant food selectivity, and the intervention addressed this concern. An article would not qualify for inclusion if a food preference assessment was conducted as part of the participant's treatment for a behavior unrelated to feeding concerns, such as self-injury or aggression.

5. Treatment components: list of procedures that were used to increase food acceptance for participants during treatment, such as nonremoval of the spoon, visual prompts, or praise.
6. Effective treatment: whether the authors concluded that the treatment was effective for participants based on visual analysis of data. If treatment was considered to be effective for any participant(s), the fraction of participants for whom treatment was effective was also reported. While a formal bias assessment was not conducted, the coders conducted visual analysis of the data, and the coders agreed with the authors' conclusions for all studies.
7. Type of preference assessment: the type of preference assessment that was conducted in the study, such as a paired-stimulus preference assessment (Fisher et al., 1992).
8. Preference assessment interobserver agreement (IOA): the average and range of percent IOA reported for the dependent variables of the food preference assessment; if authors specified the average and range of percent IOA for specific variables, these were also documented.
9. Preference assessment integrity: the average and range of percent treatment integrity reported for the food preference assessment.
10. Bolus: the mass of the food or liquid presented to the participant during the preference assessment.
11. Texture: the consistency of the food presented in the preference assessment. Texture was documented as regular texture (i.e., table food that has not been altered), finely chopped (i.e., regular texture food cut-up into small pieces; this only occurred in one study and was 4 cc), wet ground (i.e., oatmeal-like consistency), junior (i.e., apple sauce consistency), or puree (i.e., smooth like yogurt).
12. Mode of presentation: whether bites or drinks were presented as self-feeder (i.e., the participant received the opportunity to feed him or herself independently) or as non-self-feeder (i.e., the experimenter/therapist presented the bite or drink to the participant by holding the spoon or cup to the child's mouth).
13. Prompting procedures: whether the experimenter/therapist provided verbal, gestural, and/or stimulus prompts to increase the likelihood that the participant would select and/or consume a food or drink during the preference assessment. For this variable, data were also extracted regarding the procedures for when prompts were presented (e.g., providing a verbal prompt if the participant did not make selection within 5 s).
14. Hierarchy determined: whether a hierarchy of preference for edible items was determined through the preference assessment (i.e., yes or no).
15. Consequence for no response by participant: the prescribed response for the experimenter/therapist if the participant did not respond to a stimulus during the food preference assessment.
16. Consequence for avoidant response by participant: the prescribed response for the experimenter/therapist if the participant engaged in an avoidant response to a stimulus during the food preference assessment.
17. Consequence for selecting a food: the prescribed response for the experimenter/therapist if the participant selected a food during the food preference assessment.
18. Consequence for not consuming a chosen food: the prescribed response for the experimenter/therapist if the participant did not consume a selected food during the food preference assessment.
19. Consequence for engaging in inappropriate mealtime behavior (IMB) or expel of chosen food: the prescribed response for the experimenter/therapist if the participant engaged in IMB or expelled a chosen food during the food preference assessment.

Reliability

After the data were extracted from all articles, second coders independently conducted repeat extractions for 32% of the articles using the same procedures as the initial coding. After this subset of articles was coded by the second coders, agreement was assessed by determining whether the coders agreed on the extracted data (e.g., both coders reported the same type of preference assessment, the same food texture, or the same experimenter/therapist response to child responses). To calculate interobserver agreement, the total number of agreements for an article was divided by 19, which was the total number of data extractions per article. This quotient was multiplied by 100 to obtain the percent agreement for the article. The mean agreement per article was calculated by adding together the percent agreement for each article and dividing the sum by the total number of articles coded for reliability. The mean interobserver agreement value was 100%.

Results

Table 1 provides an overview of participant characteristics, what components the ultimate treatment included if treatment was eventually implemented with the participant(s), whether the ultimate treatment was effective, the type of preference assessment conducted, and preference assessment interobserver agreement and integrity. Table 2 presents the food preference assessment components for each article. Additionally, below we provide a summary of the food preference assessment components from the review.

Type of Preference Assessment

The most commonly used food preference assessment was the paired-stimulus preference assessment (Fisher et al., 1992). These procedures were employed in 82% ($n = 31$) of reviewed studies. Additionally, 8% of studies ($n = 3$) conducted both paired-stimulus and single-stimulus preference assessments (Hagopian, Rush, Lewin, & Long, 2001), and one study conducted both a single-stimulus preference assessment and a concurrent choice paradigm. During the concurrent choice paradigm participants had free access to a specified number of foods for a predetermined amount of time, and preference was determined based on the order in which each food was consumed as well as the amount consumed. Single-stimulus preference assessments were never used as the sole measure of food preference within the reviewed studies. Three studies (8%) did not identify the type of preference assessment that was used.

Bolus

In the feeding literature bolus is used to refer to the amount or size of food or liquid presented to the individual. Ten studies (26%) reported the bolus of the food presented during the preference assessment. Seven of these studies provided specific measurements of the bite or drink size, such as measurements in centimeters or comparison to an item of a consistent size (e.g., 4 cc, dime size). The other three studies provided more general measurement terms, stating that the bite was "bite size" or "a spoonful." Although these more general measurement terms may not necessarily allow for the reader to know the specific bolus, they suggest that the boluses were kept consistent across the foods in the studies. Of the remaining studies, a bolus was not applicable to the preference assessment for two of the studies because actual foods were not presented (e.g., pictures were used as representations of foods), whereas the other 68% of the studies did not specify the bolus used in their preference assessment procedures.

Texture

A variety of different textures are found in the feeding literature, which may not be limited to the textures identified in the food preference assessments within this review. Textures identified within this review included puree, junior, wet-ground, finely chopped, and regular. Puree texture is table food blended down to a smooth consistency where there are no lumps (e.g., similar to yogurt); junior texture is blended down to an applesauce-like consistency; and wet-ground texture is blended down to an oatmeal-like consistency. Finely chopped food is table food cut into 2 mm $\times$ 2 mm pieces, and finally, regular texture food describes table food that has not been altered at all but has generally been cut into bite-size pieces.

Table 1
Participant Characteristics, Treatment Components, and Preference Assessment Type, IOA, and Integrity

Study	# of participants	Sex	Age range (years)	Primary feeding concern	Treatment components	Effective treatment	Preference assessment type	Preference assessment IOA	Preference assessment integrity
Ahearn (2003)	1	1M	14	food selectivity by type	simultaneous presentation	yes for 1/1	paired-stimulus	NR	NR
Binnendyk & Lucyshyn (2009)	1	1M	6	food selectivity by type	stimulus fading, visual prompts, positive contingency statement, prompt fading, praise, escape extinction, and de-escalation procedure	yes for 1/1	NR	NR	NR
Bloomfield, Fischer, Clark, & Dove (2019)	1	1M	8	food selectivity by type	teleconsultation, stepwise changing contingency for reinforcement, guided compliance	yes for 1/1	paired-stimulus	NR	NR
Borrero, Schlereth, Rubio, & Taylor (2013)	4	4M	1–5	food selectivity by type, volume	nonremoval of the spoon, praise, physical guidance (jaw or finger prompt)	yes for 4/4	paired-stimulus	NR	NR
Borrero, England, Sarcia, & Woods (2016)	10	9M 1F	2–6	texture selectivity, food selectivity by type, liquid dependence, tube dependence	N/A	N/A	paired-stimulus	NR	NR
Chu (2012)	1	1M	6	food selectivity by type	praise, de-escalation, reinforcement, extinction, prompting, stimulus fading, visual support	yes for 1/1	paired-stimulus	NR	NR
Farrell, Hagopian, & Kurtz (2001)	1	1F	8	volume	exit criterion, re-presentation of expels, praise, contingent access to tangibles, demand fading	yes for 1/1	paired-stimulus	NR	NR
Fernand, Penrod, Fu, Whelan, & Medved (2016)	2	1M 1F	6–7	food selectivity by type	choice, nonremoval of the spoon	yes for 1/2	paired-stimulus	NR	NR
Fischer, Luiselli, & Dove (2015)	1	1M	16	food selectivity by type	demand fading, reinforcement, CBT (relaxation procedure, guided imagery, and positive self-statements)	yes for 1/1	NR	NR	NR
Fu, Penrod, Fernand, Whelan, Griffith, & Medved (2015)	2	2M	9–10	food selectivity by type	modeling, nonremoval of the spoon, DRA	yes for 2/2	paired-stimulus	NR	NR

(*table continues*)

Table 1 (*continued*)

Study	# of participants	Sex	Age range (years)	Primary feeding concern	Treatment components	Effective treatment	Preference assessment type	Preference assessment IOA	Preference assessment integrity
Galensky, Miltenberger, Stricker, & Garlinghouse (2001)	3	1M 2F	2–6	food selectivity by type	contingent access to preferred food and attention, stimulus fading, escape extinction (required to stay at table), physical re-direction to remain at table, attention extinction	no for 3/3	paired-stimulus	NR	NR
Girolami & Scotti (2001)	3	1M 2F	2	volume	N/A	N/A	paired-stimulus	NR	NR
González, Rubio, & Taylor (2014)	9	7M 2F	1–5	tube dependence, liquid dependence, food selectivity by type or texture	N/A	N/A	paired-stimulus	NR	NR
Hodges, Gerow, Davis, Radhakrishnan, Feind, Oguinn, & Prawira (2018)	2	2M	3–5	food selectivity by type	N/A	N/A	paired-stimulus	NR	NR
Johnson & King (2017)	1	1F	11	food selectivity by type	access to high preferred food contingent on acceptance of low preferred food	yes for 1/1	paired-stimulus	NR	NR
Kadey, Roane, Diaz, & Merrow (2013)	1	1M	6	food selectivity by type	physical guidance, chew and swallow prompt, DRA contingent on compliance	yes for 1/1	paired-stimulus	NR	NR
Kelley, Piazza, Fisher, & Oberdorff (2003)	1	1	1M	3	food refusal, bottle dependence	contingent access to preferred food for compliance and nonpreferred for noncompliance	yes for 1/1	paired-stimulus	100% NR
Konst, Lesser, McMahon, & Gonzalez (2017)	1	1M	13	food selectivity by type	hand-over hand, chin prompt, descriptive verbal praise, "close mmm" prompt	yes for 1/1	paired-stimulus	NR	NR
Kozlowski, Taylor, Pichardo, & Girolami (2016)	3	3M	3–5	food selectivity by type, volume	DRA, nonremoval of the spoon, hand-over-hand	yes for 3/3	paired-stimulus	95% (range, 85–100%)	NR
Kunkel, Taylor, Kozlowski, & Gonzalez (2018)	5	4M 1F	5–10	food selectivity by type	stationary plate, contingent access to avoidant food	yes for 2/3 (2 did not meet criteria)	paired-stimulus	NR	NR

Table 1 (*continued*)

Study	# of participants	Sex	Age range (years)	Primary feeding concern	Treatment components	Effective treatment	Preference assessment type	Preference assessment IOA	Preference assessment integrity
Levin & Carr (2001)	4	3M 1F	5–7	food selectivity by type	bolus fading, deprivation of preferred foods, and positive reinforcement	yes for 3/3	concurrent choice paradigm, single-stimulus	99% (range: 90–100%)	NR
Najdowski, Wallace, Doney, & Ghezzi (2003)	3	1M 2F	2–4	food selectivity by type	DRA, nonremoval of the spoon, demand fading	yes for 3/3	NR	99.5% (for child selection and consumption), 100% (for correct food presentations)	NR
Najdowski, Wallace, Reagon, Pendrod, Higbee, & Tarbox (2010).	1	1M	5	food selectivity by type	DRA, nonremoval of the spoon, demand fading	yes for 1/1	paired-stimulus	NR	100%
Penrod, Gardella, & Fernand (2012)	2	2M	9–10	food selectivity by type	demand fading	yes for 2/2	paired-stimulus, single-stimulus	NR	NR
Penrod & VanDalen (2010)	3	3M	4–5	food selectivity by type	sequential and simultaneous presentations, praise, nonremoval of spoon	yes for 3/3	paired-stimulus, single-stimulus	100%	NR
Penrod, Wallace, Reagon, Betz, & Higbee (2010)	3	3M	3–4	food selectivity by type	DRA, bite fading, reinforcer manipulation, escape prevention	yes for 3/3	paired-stimulus	99%	NR
Pizzo, Coyle, Seiverling, & Williams (2012)	1	1M	16	food selectivity by type	praise, access to preferred food contingent on accepting pea sized bites of novel/nonpreferred foods	yes for 1/1	paired-stimulus	NR	NR
Rivas, Piazza, Roane, Volkert, Stewart, Kadey, & Groff (2014)	1 (2/3 did not meet criteria)	2M 1F	2–3	food refusal, food selectivity by type	contingent presentation of nonpreferred food for noncompliance	yes for 3/3	paired-stimulus	97%	NR
Rubio, Borrero, & Taylor (2015)	2	2F	2–3	food refusal, liquid dependence	nonremoval of the spoon, jaw prompt, finger prompt, side deposit	yes for 2/2	paired-stimulus	NR	NR
Silbaugh & Swinnea (2019)	3	2M 1F	4–6	food selectivity by type, color, and shape	mixture of low and high probability demands, reinforcement	no for 3/3	paired-stimulus	NR	NR
Sira & Fryling (2012)	1	1M 1F	6–9	food selectivity by type	DRA (food or tangible item), token economy, peer modeling	yes for 1/1	paired-stimulus	NR	NR

(*table continues*)

Table 1 (*continued*)

Study	# of participants	Sex	Age range (years)	Primary feeding concern	Treatment components	Effective treatment	Preference assessment type	Preference assessment IOA	Preference assessment integrity
Taylor (2018)	1	1M	9	food and liquid refusal, food selectivity by type	nonremoval of the spoon, finger prompt and side deposit, contingent access, differential attention	yes for 1/1	paired-stimulus	NR	NR
Ulloa, Borrero, & Borrero (2019)	3	3M	3–5	food selectivity by type and texture, liquid dependence	DRA, stationary spoon, bolus fading, nonremoval of the spoon, finger prompt with a side deposit	yes for 3/3	paired-stimulus	NR	NR
VanDalen & Penrod (2010)	2	2M	4–5	food selectivity by type	simultaneous presentation with DRA, sequential presentation with DRA, escape extinction	yes for 2/2	paired-stimulus, single-stimulus	100%	NR
Vaz, Volkert, & Piazza (2011)	1	1M	6	food selectivity by type and texture	contingent presentation of avoidant food on a NUK® brush	yes for 1/1	paired-stimulus	NR	NR
Volkert, Piazza, & Ray-Price (2016)	3	3M	2–4	volume	nonremoval of the spoon, flip spoon, DRA	yes for 3/3	paired-stimulus	NR	NR
Whelan & Penrod (2019)	2	2M	3–6	food selectivity by type	contingent presentation of high preferred food following consumption of low preferred food	yes for 2/2	paired-stimulus	NR	NR
Whipple, Scherr, & Kozlowski (2020)	1	1M	4	food selectivity by type	nonremoval of the spoon, simultaneous presentation, finger prompt with side deposit, DRA	yes for 1/1	paired-stimulus	NR	NR

Note. CBT = cognitive-behavioral treatment; DRA = differential reinforcement of alternative behavior; NR = not reported; N/A = not applicable; M = male; F = female.

Table 2
Food Preference Assessment Components

Study	Bolus	Texture	Mode of presentation	Prompting procedures	Was hierarchy determined?	Consequence for no response by participant	Consequence for avoidant response by participant	Consequence for selecting a food	Consequence for not consuming a chosen food	Consequence for engaging in IMB or expel of chosen food
Ahearn (2003)	NR	NR (assuming regular based on other information)	NR (assuming self-feeder because of other information)	NR	yes for 1/1	NR	NR	NR	NR	NR
Binnendyk & Lucyshyn (2009)	NR	regular	NR for first assessment, free access for the second assessment	NR	no for 1/1 during the first assessment, yes for 1/1 during the second assessment	NR	NR	NR	NR	NR
Bloomfield, Fischer, Clark, & Dove (2019)	N/A	N/A	N/A	NR	yes for 1/1	NR	NR	NR	N/A	N/A
Borrero, Schlereth, Rubio, & Taylor (2013)	NR	puree, junior, regular	NR	NR	NR	NR	NR	NR	NR	NR
Borrero, England, Sarcia, & Woods (2016)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chu (2012)	NR	NR (assuming regular based on other information)	NR	NR	NR	NR	NR	NR	NR	NR
Farrell, Hagopian, & Kurtz (2001)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Fernand, Penrod, Fu, Whelan, & Medved (2016)	NR	regular	NR	NR	yes for 2/2	NR	NR	NR	NR	NR
Fischer, Luiselli, & Dove (2015)	bite size	regular	self-feeder	prompt to eat the food	yes for 1/1	NR	NR	NR	NR	NR
Fu, Penrod, Fernand, Whelan, Griffith, & Medved (2015)	NR	regular	NR	NR	yes for 2/2	NR	NR	NR	NR	NR
Galensky, Miltenberger, Stricker, & Garlinghouse (2001)	NR	regular	self-feeder	NR	yes for 3/3	NR	NR	NR	NR	NR
Girolami & Scotti (2001)	about one spoonful	regular	initial self-feeder	"which one do you want?"	yes for 3/3	NR	NR	NR	presented the bite as a non-self-feeder	NR
González, Rubio, & Taylor (2014)	NR	puree, junior, wet ground	NR	initial verbal prompt	yes for 9/9	NR	NR	NR	NR	NR
Hodges, Gerow, Davis, Radhakrishnan, Feind, Oguinn, & Prawira (2018)	1cm bite size	regular	NR	NR	yes for 2/2	NR	NR	NR	NR	NR

(*table continues*)

Table 2 (*continued*)

Study	Bolus	Texture	Mode of presentation	Prompting procedures	Was hierarchy determined?	Consequence for no response by participant	Consequence for avoidant response by participant	Consequence for selecting a food	Consequence for not consuming a chosen food	Consequence for engaging in IMB or expel of chosen food
Johnson & King (2017)	N/A	N/A	NR	NR	yes for 1/1	NR	NR	NR	NR	NR
Kadey, Roane, Diaz, & Merrow (2013)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Kelley, Piazza, Fisher, & Oberdorff (2003)	NR	NR (assuming regular based on other information)	NR	NR	yes for 1/1	NR	NR	NR	NR	NR
Konst, Lesser, McMahon, & Gonzalez (2017)	NR	applesauce-like texture	NR	NR	yes for 1/1	NR	NR	NR	NR	NR
Kozlowski, Taylor, Pichardo, & Girolami (2016)	for one participant, 3.75mL and for two, 7.5mL	liquid	non-self-feeder (2 participants) and self-feeder (1 participant)	initial verbal prompt	no for 3/3	removed the pair and presented the choice again	immediately removed the drinks	stationary cup for 30 s	30-s stationary cup	blocked attempts to throw or dump the liquids
Kunkel, Kozlwoski, Taylor, & Gonzalez (2018)	NR	NR	NR	initial verbal prompt	no for 5/5	if no response for 2 trials, then moved onto the next trial	NR	chosen food was presented	removed after 10 s	NR
Levin & Carr (2001)	bite size	regular	self-feeder	initial verbal prompt	yes for 4/4	therapist modeled the response and presented the choice	NR	chosen food was presented	NR	NR
Najdowski, Wallace, Doney, & Ghezzi (2003)	NR	regular	self-feeder	NR	yes for 3/3	NR	NR	NR	NR	NR
Najdowski, Wallace, Reagon, Pendrod, Higbee, & Tarbox (2010)	NR	regular	NR	NR	yes for 1/1	NR	NR	NR	NR	NR

Table 2 (*continued*)

Study	Bolus	Texture	Mode of presentation	Prompting procedures	Was hierarchy determined?	Consequence for no response by participant	Consequence for avoidant response by participant	Consequence for selecting a food	Consequence for not consuming a chosen food	Consequence for engaging in IMB or expel of chosen food
Penrod, Gardella, & Fernand (2012)	NR	regular	self-feeder	verbal prompt	yes for 2/2	prompted to try the food following 5 s of not making a choice during single stimulus, NR for paired choice	NR	item available for 5 s during single stimulus, NR for paired choice	prompt to try the food during the single stimulus, NR for the paired choice	food was removed during the single stimulus, NR for the paired choice
Penrod & VanDalen (2010)	NR	NR (assuming regular based on other information)	self-feeder	verbal prompt only if no selection within 5 s of the presentation	yes for 3/3	NR for the paired stimulus, child was prompted to sample both during the single stimulus	NR	NR	NR	NR
Penrod, Wallace, Reagon, Betz, & Higbee (2010)	NR	regular	self-feeder	NR	yes for 3/3	NR	NR	NR	NR	NR
Pizzo, Coyle, Seiverling, & Williams (2012)	NR	regular	NR	NR	yes for 1/1	NR	NR	NR	NR	NR
Rivas, Piazza, Roane, Volkert, Stewart, Kadey, & Groff (2014)	4cc	finely chopped	non-self-feeder	initial verbal prompt	yes for 1/1	presented the next choice following 30 s of not making a choice	NR	praise and touched the spoon to the child's lip for 30 s	NR	did not re-present expels
Rubio, Borrero, & Taylor (2015)	NR	puree, junior	NR	NR	NR	NR	NR	NR	NR	NR
Silbaugh & Swinnea (2019)	NR	NR (assuming regular based on other information)	NR	NR	yes for 2/2	NR	NR	NR	NR	NR

(*table continues*)

Table 2 (*continued*)

Study	Bolus	Texture	Mode of presentation	Prompting procedures	Was hierarchy determined?	Consequence for no response by participant	Consequence for avoidant response by participant	Consequence for selecting a food	Consequence for not consuming a chosen food	Consequence for engaging in IMB or expel of chosen food
Sira & Fryling (2012)	NR	NR	NR	NR	yes for 2/2	NR	NR	NR	NR	NR
Taylor (2018)	1cm square	NR (assuming regular based on other information)	self-feeder	initial verbal prompt	yes for 1/1	NR	NR	waited 10 s	removed the food after 10 s	blocked attempts to dump or throw the food
Ulloa, Borrero, & Borrero (2019)	level, nickel	junior, naturally lower, regular	NR	NR	NR	NR	NR	NR	NR	NR
VanDalen & Penrod (2010)	NR	NR (assuming regular based on other information)	NR	NR	yes for 2/2	NR	NR	NR	NR	NR
Vaz, Volkert, & Piazza (2011)	NR	puree	NR	NR	yes for 1/1	NR	NR	NR	NR	NR
Volkert, Piazza, & Ray-Price (2016)	for one, 2cc food, 4cc liquid	NR	non-self-feeder	initial verbal prompt	yes for 2/2	the food was removed, following modification the food was presented on a NUK® brush	the food was removed, following modification the food was presented on a NUK® brush	chosen bite presented at the upper lip for 30 s	stationary spoon for 30 s, following modification nonremoval of the spoon and the food was presented on a NUK® brush	initially bite was removed, following modifications re-presented for 30 s
Whelan & Penrod (2019)	NR	regular	self-feeder	NR	yes for 2/2	NR	NR	NR	NR	NR
Whipple, Scherr, & Kozlowski (2020)	dime size	regular	self-feeder	NR	yes for 1/1	NR	NR	NR	NR	NR

Note. IMB = inappropriate mealtime behavior; NR = not reported; N/A = not applicable.

Twenty-three studies (61%) specified the texture of foods presented in the preference assessment. For example, Volkert, Piazza, and Ray-Price (2016) reported presenting puree texture foods; Konst, Lesser, McMahon, and González (2017) reported presenting junior texture foods; Fischer, Luiselli, and Dove (2015) reported presenting foods at regular texture; Rivas and colleagues (2014) reported presenting finely chopped foods; and González, Rubio, and Taylor (2014) reported presenting a combination of puree, junior, and wet-ground textured foods, depending on the participant. The authors did not explicitly specify the texture used in the preference assessment for seven of the studies included in this review (18%); however, from the information in the article, it can be inferred that the preference assessment included regular texture foods. For two studies (5%), texture was not applicable to the study because actual food items were not presented in the food preference assessment; for one, an interview was conducted, and for the other, pictures of foods were presented. All remaining studies (16%) did not specify the texture of foods presented in the preference assessment, and the texture was not able to be readily determined based on other information provided.

Mode of Presentation

When considering the mode of presentation (self-feeder or non-self-feeder) used in preference assessments, 42% ($n = 16$) of the studies clearly specified if preference assessment procedures were conducted using a self-feeder (SF) or non-self-feeder (NSF) format. A SF mode of presentation was coded if the child was given the opportunity to consume the presented bite of food/drink on their own without any physical assistance from the experimenter/therapist. If the experimenter/therapist initially presented the bite of food/drink to the child by bringing it directly up to their mouth and fed it to them, and therefore the child was not provided an opportunity to feed themselves, the NSF mode of presentation was coded. Two of the studies (5%) reported using NSF as the mode of presentation, 11 studies (29%) indicated the use of SF procedures, and one study (3%) used SF for two participants and NSF for one participant. One study (3%) presented bites as SF initially, but contingent on the child not consuming the food they selected in the assessment, a NSF presentation was utilized. Additionally, one other study (3%) used NSF procedures in one of their preference assessments but used SF procedures in their other assessment. The remaining 58% of studies did not specify whether SF or NSF procedures were used in the preference assessment.

Prompting Procedures

Eleven (29%) of the studies reviewed described the level of prompting that was provided by the experimenter/therapist upon the initial presentation of the edible items during the preference assessment. Of those 11 studies, 10 (26%) described the use of an initial verbal prompt to make a selection (e.g., "choose one") when the food items were placed in front of the child. The other study described the use of a verbal prompt only if the participant failed to make a selection within 5 s of the presentation of the food items. The remaining 71% of studies did not report the prompting methods used.

Experimenter/Therapist Response to Child Responses

Consequence for no response by participant. When food or drink is presented in a preference assessment, the participant may not respond to the presentation of the item (e.g., not approach the item and therefore not make a choice). Of the studies reviewed, 18% of studies ($n = 7$) specified within the procedures of the preference assessment how experimenters/therapists responded to a participant who did not approach foods during the preference assessment. Two (5%) of those seven studies described that experimenters/therapists would remove foods from the meal area and then move on to the next presentation or trial; though an exception to this occurred in one of those studies in which for one participant who never made any choices in the assessment, the experimenter/therapist chose for him and used a NUK® brush and nonremoval procedures for 30 s to deposit the bite. The other five studies (13%) utilized various procedures to repeat the presentation of the same two items as a second trial before moving onto the next presentation. Two (5%) of those five studies included an additional verbal prompt to try the food items (only during the single-stimulus preference assessment pro-

cedures) as well as the implementation of nonremoval if no choice was made in the paired-stimulus assessment. One (3%) of the five studies described that the experimenter/therapist would model taking the bite by consuming the food and commenting that it tasted good, and then presenting those same items again. Two (5%) of those five studies indicated that if no response was made, then the experimenter/therapist would remove the presented pair and represent both choices again a second time. If no response was made during that representation, the experimenter/therapist moved to the next trial. The remaining 82% of studies did not provide information regarding how experimenters/therapists responded when a participant did not approach a presented food during the food preference assessment.

Consequence for avoidant response by participant. During a food preference assessment, a participant may also engage in an avoidant response (e.g., push the food away) upon the initial presentation of food. Two of the studies reviewed (5%) described how experimenters/therapists responded if an avoidant response was made. Both described that the food/drink was immediately removed contingent on an avoidant response. However, due to continued avoidant responses of one participant, procedures in one of those studies were modified so that, contingent on an avoidant response, the experimenter/therapist selected a food and presented it with a NUK® brush using nonremoval procedures for 30 s. The remaining 95% of studies did not describe how experimenters/therapists responded to an avoidant response.

Consequence for selecting a food. Only seven (18%) of the studies provided details regarding the experimenter/therapist's response to the child making a choice during the preference assessment. Of those seven studies, two studies (5%) described the use of a stationary cup or spoon procedure for 30 s. A stationary spoon or cup procedure involves the experimenter/therapist presenting the bite or drink as NSF to the child's upper lip and keeping it stationary in the same position regardless of the child's behavior. The bite or drink remains stationary until the specified time interval elapses or the child opens their mouth and takes the bite/drink. One of those two studies (3%) also included the use of nonremoval and presentation of the bite on a NUK® brush as a modification to the original stationary spoon procedure. One of the seven studies (3%) explained that the experimenter/therapist provided praise to the child after they made a choice and then touched the spoon to the child's lip for 30 s; another study (3%) reported that experimenters/therapists waited 10 s for the child to consume the chosen bite, and another study (3%) mentioned making the edible item available for 5 s during the single-stimulus preference assessment but immediately implementing nonremoval (NSF) during the paired-stimulus preference assessment. Lastly, two of those seven studies (5%) stated that the chosen food item was presented to the child, but specifics of how this was done were not reported. The remaining 82% of studies did not discuss the experimenter/therapist's response to the child when a choice was made during the preference assessment.

Consequence for not consuming a chosen food. An individual may also choose to not consume the food even though they did make a clear choice in the preference assessment. Of the studies reviewed, only 16% ($n = 6$) described the consequence for not consuming a chosen food. One of those six studies (3%) indicated that the bite was presented as NSF if the child did not immediately consume the food they selected. Two of the six studies (5%) stated that the experimenter/therapist removed the food if the child had not eaten it after 10 s, while another two of the studies (5%) described the use of a stationary spoon or cup procedure for 30 s. Of the two studies utilizing a stationary spoon or cup procedure, one study modified their procedures to include the use of nonremoval and the presentation of the bite on a NUK® brush. Lastly, one of the six studies (3%) included a prompt to try the chosen food during the single-stimulus preference assessment but included nonremoval in the paired-stimulus preference assessment. The remaining 84% of studies did not report the consequences provided if the child did not consume the food they chose during the preference assessment.

Consequence for engaging in inappropriate mealtime behavior (IMB) or expel of chosen food. When presenting edibles in a preference assessment, the individual may make a selection but then engage in IMB during these presentations (e.g., pushing bite away, turning their head away from the food, covering their mouth) or expel the bite or drink. Five of the

reviewed studies (13%) included a description of how experimenters/therapists responded to IMB or expels during the preference assessment. Of those five studies, two studies (5%) reported that the experimenter/therapist blocked the participant from dumping or throwing food or liquid, one study (3%) mentioned that expels were not represented but instead the next trial in the assessment was initiated, and one study (3%) stated that the food item was removed contingent on IMB during the single-stimulus preference assessment but that nonremoval procedures were implemented during the paired-stimulus preference assessment. The final study of those five studies reported that they initially removed the bite of food if it was expelled, but after modifications were made to the procedures, the expelled bites were represented (i.e., bite that was spit out was scooped up with the spoon and presented again to the child) and nonremoval was implemented for 30 s. The remaining 87% of studies did not include a description of how the experimenter/therapist responded to the child when they engaged in IMB or expelled the chosen food.

Quality Assessment (Interobserver Agreement and Treatment Integrity)

Interobserver agreement (IOA) is an indicator of measurement quality that is not only useful in detecting measurement errors but communicates the trustworthiness of data. Treatment or procedural integrity refers to the extent to which a procedure is implemented as planned and is important for the dissemination of evidence-based practices. Twenty-one percent of studies ($n = 8$) reported data on preference assessment IOA and 3% of the studies ($n = 1$) reported procedural integrity on the preference assessment procedures implemented. When reported, IOA and procedural integrity were high. Of the studies that met the inclusion criteria, none of the articles reported both IOA and procedural integrity on the preference assessment procedures utilized.

Discussion

The current review synthesized the procedures for conducting food preference assessments in 38 studies identified in the feeding literature. We found that although participant characteristics (i.e., number, sex, and age of participants; primary feeding concern) and ultimate treatment procedures, if relevant, were included in all articles, the amount of information provided about the food preference assessments themselves was variable. In fact, the type of preference assessment, the texture of the food, and whether or not a preference hierarchy was determined for each participant were the only details explicitly provided in the majority of the articles. However, a large number of other factors are carefully considered when conducting food preference assessments with children with feeding disorders. We hypothesize that it is likely the case that additional details were not included in many of these articles because the food preference assessment was not the focus of the article, but rather an assessment that was conducted and influenced the treatment the authors were highlighting. For example, VanDalen and Penrod (2010) conducted food preference assessments to identify high preferred and nonpreferred foods to use during a comparison of sequential versus simultaneous presentation of nonpreferred foods; a hierarchy of preference was determined for both participants, and both presentation methods produced an increase in acceptance and consumption of nonpreferred foods when combined with an escape extinction procedure. Nonetheless, the absence of detailed food preference assessment procedures within the feeding literature can be problematic. Engagement in evidence-based practice is of the utmost importance within our field, and peer reviewed research is one opportunity for clinicians to learn this information.

One of the first things clinicians may consider when conducting a food preference assessment with a child with a feeding disorder is identifying what type of preference assessment would be most appropriate. Based on the articles reviewed, the food preference assessment procedure most commonly reported was the paired-stimulus preference assessment described by Fisher and colleagues (1992; 82% of articles reviewed), whereas most other articles reviewed did not specify what type of preference assessment they used. When conducting paired-stimulus preference assessments, or other types of preference assessments that require the child to make a choice (e.g., multiple stimulus with or without replacement), the child's ability to make choices is critical because clinicians often

rely on the child's choice-making to determine their preferences. However, because a child with a feeding disorder may engage in avoidance or problem behavior during a food preference assessment, as many or all of the stimuli presented may be nonpreferred, the child's ability to make choices within the assessment may be unclear. This is a factor that should be considered prior to and when conducting a food preference assessment relying on choice. In an effort to determine whether the child's responses within the food preference assessment will be indicative of their preferences, one strategy clinicians may employ is first conducting an identical format preference assessment with toys, with at least some of the stimuli hypothesized to be preferred. If the child does not make choices within that tangible-item preference assessment, the clinician could identify an alternative preference assessment format (e.g., single-stimulus) to assess the child's preferences for foods.

The texture and bolus of the foods are also important characteristics to consider and identify, though we found that inclusion of this type of information within the articles was often absent. Exclusion of this information does not indicate that the authors of the studies did not consider these variables or ensure the child's safety by tailoring the texture and bolus within each study according to the child; however, including this information and a justification for these choices could benefit readers. These variables should be based on the child's chewing history, skill level, and sometimes recommendations from oral-motor therapists (e.g., speech-language pathologists or occupational therapists with specialized training). One must consider whether the child exhibits the skill level required to successfully and safely consume the foods being presented due to the complex nature of eating. If the child is not able to safely chew regular texture foods, if a preference assessment is conducted, it should contain lower-texture foods (e.g., purees) to ensure the child's safety. For example, a child may pack regular texture food because of oral-motor deficits (Patel, Piazza, Layer, Coleman, & Swartzelder, 2005), which can lead to an increased risk of aspiration (Gulotta, Piazza, Patel, & Layer, 2005). However, if lower-texture foods are chosen for the preference assessment, the child's ability to discriminate between the lower texture foods should also be considered to determine the utility of conducting the preference assessment. Visually, the foods will look similar with the possible exception of color. If two similar colored purees are presented (e.g., broccoli and green beans), the child can only be expected to discriminate between the foods based on name, smell, and taste. This may allow for an accurate hierarchy of preference to be determined if the child is able to discriminate between the foods based on these characteristics; however, if the child is unable to discriminate based on these characteristics, the utility of a food preference assessment in these situations is questionable. The amount of food also plays an important role when it comes to the results of the assessment. Consumption of food may decrease and problem behavior increase as bite size gets larger (Kerwin, Ahearn, Eicher, & Burd, 1995). This may be even more critical to consider if differing boluses of different foods are presented throughout the assessment. Therefore, the bolus being presented should be described and kept consistent across foods.

The mode of presentation (e.g., self-feeder, non-self-feeder) may also impact the results of the assessment and should be considered and reported. If a child is presented with a bite as a self-feeder, they might not have the skills necessary to place the spoon in their mouth, especially if food has not been presented this way in the past. This may then result in the inability to establish a preference hierarchy, not because the child does not have actual food preferences, but because they do not have the skills required to self-feed bites. It is not uncommon for children with feeding disorders to lack the motivation to self-feed even if they have the necessary skills (Volkert et al., 2016); therefore, clinicians may consider presenting bites as a non-self-feeder so that the child's willingness to self-feed, or lack thereof, does not impact the results of the preference assessment.

Moreover, clear operational definitions and technological descriptions are needed within the food preference assessment literature in regard to prompting procedures and responses to the child's behaviors. In the current review, only 29% of the articles described prompting procedures, and less than 20% included technological descriptions for how the experimenter/therapist would respond to each response a child could make during the assessment. In most cases, food refusal is an escape-

maintained behavior (Piazza, Fisher, et al., 2003) so it is not surprising that children with a feeding disorder may not make choices or avoid foods during a food preference assessment, highlighting the importance of defining any prompting procedures included in the assessment. Perhaps even more importantly, future researchers should determine responses dependent on child behavior during the food preference assessment. Children with feeding disorders are likely to engage in avoidance responses (e.g., head turns, batting at or blocking the spoon, throwing food or utensils, food expulsion), before or after choosing a food, than children without feeding difficulties (Crist & Napier-Phillips, 2001). If a child either does not respond to or engages in an avoidance response when a food is initially presented, clinicians could respond as they normally would according to the preference assessment format that they are using (e.g., removing the stimulus), though this should be specified. Where there likely could be differences between food preference assessments with children with and without feeding disorders is how to respond when a child does make a selection, or if the child makes a selection and then engages in a problem behavior. Eating is a complex process that involves multiple steps in a chain, including acceptance, chewing (e.g., lateralization of the food to the molars and subsequent mastication), and finally swallowing (Volkert, Peterson, Zeleny, & Piazza, 2014). Children with feeding disorders may have difficulties at any point in this process, which could disrupt eating. How the bite is presented may impact whether or not a selected food is actually accepted. Furthermore, problem behaviors, such as IMB, expelling, or packing (i.e., holding a bolus in the mouth for an extended period of time) could occur after the child has approached or selected a food within the food preference assessment. How the clinician responds to these behaviors needs to be clearly outlined, as well as how instances of these behaviors are captured within the results of the food preference assessment. For example, if a child selects a food and then packs the bite, there needs to be a determination regarding what the clinician's response would be, which could include waiting until the child swallows (e.g., Stubbs, Volkert, Rubio, & Ottinger, 2017), removal of the bite after a specified amount of time that it has been packed (e.g., Kozlowski, Taylor, Pichardo, & Girolami, 2016), or setting a pack or move-on rule in which bites continue to be presented until the limit is reached and then bites are discontinued until swallowing occurs (e.g., Stubbs et al., 2017). There are varying purposes of conducting food preference assessments with children with feeding disorders and those reasons may guide how the assessment is modified.

In line with decisions regarding responses to child behavior within the assessment, an additional factor to consider is what dependent variable is determining the child's preference. Actual foods were presented within the food preference assessments in 95% ($n = 36$) of the articles we reviewed, whereas a stimulus representing a food (e.g., a picture) was used during food preference assessments in 5% ($n = 2$) of the articles reviewed (Bloomfield, Fischer, Clark, & Dove, 2019; Johnson & King, 2017). For all articles in which foods were presented within the food preference assessment, consumption was used as the dependent variable by which preference was determined. However, as noted above, for children with feeding disorders, consumption may be less likely and avoidant responses more common during the food preference assessment, thereby resulting in a possible inability to identify a food preference hierarchy in this manner. Although this was not the case in this review given that a preference hierarchy was able to be established in the majority of articles, and in the few cases a hierarchy was unable to be established a revision to the preference assessment procedures or an alternative assessment resulted in the authors being able to glean the information needed, this could certainly emerge as a concern. The primary feeding concern in the vast majority of the articles identified through this review was food selectivity, which may help explain why consumption was able to effectively be used as a dependent variable to measure preference. In these cases, the participants consumed at least some foods, and therefore theoretically could be more likely to make choices, especially if foods they consumed were included in the food preference assessments. On the other hand, children with total food refusal (e.g., tube dependence, liquid dependence) may not consume any foods during the food preference assessment. For these particular children, using consumption as the dependent variable in a food preference assessment could result in lack of a hierarchy and thus a lack of usefulness of the assessment. However, using another dependent variable, such as approaching a food, might result

in a preference hierarchy being established and thus provide useful information. Future research could examine the utility of food preference assessments for children with total food refusal when approaching a food, or even accepting the food into their mouth but not consuming it, is used as the dependent variable to assess preference rather than consumption. Additionally, these dependent variables could also be examined with respect to assessing preference in children with food selectivity in which preferred foods are not presented within the food preference assessment.

The current review highlights the clarifications and modifications needed when using food preference assessments with children with feeding disorders. Similar to the recommendations of Goday et al. (2019) to adopt a more universally accepted and comprehensive definition of a pediatric feeding disorder, we also believe the same is true of the procedures for food preference assessments conducted with children with feeding disorders. Although studies in the current review provided some information regarding the food preference assessment, we found that many procedural details were generally absent. IOA and procedural integrity were also rarely reported, which are commonplace in our field to demonstrate that data are reliable and procedures implemented appropriately. While it is probable that some missing information may just not have been reported by authors but was identified in the child's individual protocol (e.g., bolus, texture), to further advance using food preference assessments to help guide feeding treatments, researchers could explicitly define the process of determining the bolus, texture, mode of presentation, prompts delivered, and responses to child behaviors, and subsequently report these operational definitions and technological descriptions of the food preference assessments. The technological description of a food preference assessment may help obtain clearer results or, at a minimum, provide the clinician with clear steps of how to conduct the assessment.

References

*References marked with an asterisk indicate studies reviewed for this article.

*Ahearn, W. H. (2003). Using simultaneous presentation to increase vegetable consumption in a mildly selective child with autism. *Journal of Applied Behavior Analysis, 36,* 361–365. http://dx.doi.org/10.1901/jaba.2003.36-361

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: Author.

*Binnedndyk, L., & Lucyshyn, J. M. (2009). A family-centered positive behavior support approach to the amelioration of food refusal behavior: An empirical case study. *Journal of Positive Behavior Interventions, 11,* 47–62. http://dx.doi.org/10.1177/1098300708318965

*Bloomfield, B. S., Fischer, A. J., Clark, R. R., & Dove, M. B. (2019). Treatment of food selectivity in a child with avoidant/restrictive food intake disorder through parent teleconsultation. *Behavior Analysis in Practice, 12,* 33–43. http://dx.doi.org/10.1007/s40617-018-0251-y

*Borrero, C. S. W., England, J. D., Sarcia, B., & Woods, J. N. (2016). A comparison of descriptive and functional analyses of inappropriate mealtime behavior. *Behavior Analysis in Practice, 9,* 364–379. http://dx.doi.org/10.1007/s40617-016-0149-5

*Borrero, C. S. W., Schlereth, J. G., Rubio, E. K., & Taylor, T. (2013). A comparison of two physical guidance procedures in the treatment of pediatric food refusal. *Behavioral Interventions, 28,* 261–280. http://dx.doi.org/10.1002/bin.1373

*Chu, S. Y. (2012). A family-centered positive behavior support approach to intervene food refusal behavior for a child with autism. *The Journal of Special Education, 36,* 37–60.

Connie, D. E., & Vollmer, T. R. (2019). Relative preferences for edible and leisure stimuli in children with autism. *Journal of Applied Behavior Analysis, 52,* 557–573. http://dx.doi.org/10.1002/jaba.525

Crist, W., & Napier-Phillips, A. (2001). Mealtime behaviors of young children: A comparison of normative and clinical data. *Journal of Developmental & Behavioral Pediatrics, 22,* 279–286.

*Farrell, D. A., Hagopian, L. P., & Kurtz, P. F. (2001). A hospital-and home-based behavioral intervention for a child with chronic food refusal and gastrostomy tube dependence. *Journal of Developmental and Physical Disabilities, 13,* 407–418. http://dx.doi.org/10.1023/A:1012241630667

*Fernand, J. K., Penrod, B., Fu, S. B., Whelan, C. M., & Medved, S. (2016). The effects of choice between nonpreferred foods on the food consumption of individuals with food selectivity. *Behavioral Interventions, 31,* 87–101. http://dx.doi.org/10.1002/bin.1423

*Fischer, A. J., Luiselli, J. K., & Dove, M. B. (2015). Effects of clinic and in-home treatment on consumption and feeding-associated anxiety in an adolescent with avoidant/restrictive food intake disorder. *Clinical Practice in Pediatric Psychology, 3,* 154–166. http://dx.doi.org/10.1037/cpp0000090

Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A com-

parison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis, 25,* 491–498. http://dx.doi.org/10.1901/jaba.1992.25-491

*Fu, S. B., Penrod, B., Fernand, J. K., Whelan, C. M., Griffith, K., & Medved, S. (2015). The effects of modeling contingencies in the treatment of food selectivity in children with autism. *Behavior Modification, 39,* 771–784. http://dx.doi.org/10.1177/0145445515592639

*Galensky, T. L., Miltenberger, R. G., Stricker, J. M., & Garlinghouse, M. A. (2001). Functional assessment and treatment of mealtime behavior problems. *Journal of Positive Behavior Interventions, 3,* 211–224. http://dx.doi.org/10.1177/109830070100300403

*Girolami, P. A., & Scotti, J. R. (2001). Use of analog functional analysis in assessing the function of mealtime behavior problems. *Education and Training in Mental Retardation and Developmental Disabilities, 36,* 207–223.

Goday, P. S., Huh, S. Y., Silverman, A., Lukens, C. T., Dodrill, P., Cohen, S. S., . . . Phalen, J. A. (2019). Pediatric feeding disorder—Consensus definition and conceptual framework. *Journal of Pediatric Gastroenterology and Nutrition, 68,* 124–129. http://dx.doi.org/10.1097/MPG.0000000000002188

*González, M. L., Rubio, E. K., & Taylor, T. (2014). Inappropriate mealtime behavior: The effects of noncontingent access to preferred tangibles on responding in functional analyses. *Research in Developmental Disabilities, 35,* 3655–3664. http://dx.doi.org/10.1016/j.ridd.2014.08.016

Gulotta, C. S., Piazza, C. C., Patel, M. R., & Layer, S. A. (2005). Using food redistribution to reduce packing in children with severe food refusal. *Journal of Applied Behavior Analysis, 38,* 39–50. http://dx.doi.org/10.1901/jaba.2005.168-03

Hagopian, L. P., Rush, K. S., Lewin, A. B., & Long, E. S. (2001). Evaluating the predictive validity of a single stimulus engagement preference assessment. *Journal of Applied Behavior Analysis, 34,* 475–485. http://dx.doi.org/10.1901/jaba.2001.34-475

*Hodges, A., Gerow, S., Davis, T. N., Radhakrishan, S., Feind, A., Oguinn, N., & Prawira, C. (2018). An initial evaluation of trial-based functional analyses of inappropriate mealtime behavior. *Journal of Developmental and Physical Disabilities, 30,* 391–408. http://dx.doi.org/10.1007/s10882-018-9592-2

*Johnson, H. E., & King, S. (2017). Increasing food variety and intake using high-probability sequencing. *Journal of the Division on Autism and Developmental Disabilities, 4,* 80–91.

*Kadey, H. J., Roane, H. S., Diaz, J. C., & Merrow, J. M. (2013). An evaluation of chewing and swallowing for a child diagnosed with autism. *Journal of Developmental and Physical Disabilities, 25,* 343–354. http://dx.doi.org/10.1007/s10882-012-9313-1

Kang, S., O'Reily, M., Lancioni, G., Falcomata, T. S., Sigafoos, J., & Xu, Z. (2013). Comparison of the predictive validity and consistency among preference assessment procedures: A review of the literature. *Research in Developmental Disabilities, 34,* 1125–1133. http://dx.doi.org/10.1016/j.ridd.2012.12.021

*Kelley, M. E., Piazza, C. C., Fisher, W. W., & Oberdoff, A. J. (2003). Acquisition of cup drinking using previously refused foods as positive and negative reinforcement. *Journal of Applied Behavior Analysis, 36,* 89–93. http://dx.doi.org/10.1901/jaba.2003.36-89

Kerwin, M. E., Ahearn, W. H., Eicher, P. S., & Burd, D. M. (1995). The costs of eating: A behavioral economic analysis of food refusal. *Journal of Applied Behavior Analysis, 28,* 245–260. http://dx.doi.org/10.1901/jaba.1995.28-245

*Konst, M. J., Lesser, A. D., McMahon, M., & González, M. (2017). The impact of food viscosity and preference on treating a feeding problem. *Journal of Developmental and Physical Disabilities, 29,* 547–555. http://dx.doi.org/10.1007/s10882-017-9542-4

*Kozlowski, A. M., Taylor, T., Pichardo, D., & Girolami, P. A. (2016). The impact of emerging liquid preference in the treatment of liquid refusal. *Journal of Developmental and Physical Disabilities, 28,* 443–460. http://dx.doi.org/10.1007/s10882-016-9482-4

*Kunkel, K. R., Taylor, T., Kozlowski, A. M., & González, M. L. (2018). Validating a food avoidance assessment for children with food selectivity. *Behavioral Development, 23,* 89–105. http://dx.doi.org/10.1037/bdb0000078

*Levin, L., & Carr, E. G. (2001). Food selectivity and problem behavior in children with developmental disabilities. *Behavior Modification, 25,* 443–470. http://dx.doi.org/10.1177/0145445501253004

*Najdowski, A. C., Wallace, M. D., Doney, J. K., & Ghezzi, P. M. (2003). Parental assessment and treatment of food selectivity in natural settings. *Journal of Applied Behavior Analysis, 36,* 383–386. http://dx.doi.org/10.1901/jaba.2003.36-383

*Najdowski, A. C., Wallace, M. D., Reagon, K., Pendrod, B., Higbee, T. S., & Tarbox, J. (2010). Utilizing a home-based parent training approach in the treatment of food selectivity. *Behavioral Interventions, 25,* 89–107. http://dx.doi.org/10.1002/bin.298

Patel, M. R., Piazza, C. C., Layer, S. A., Coleman, R., & Swartzelder, D. M. (2005). A systematic evaluation of food textures to decrease packing and increase oral intake in children with pediatric feeding disorders. *Journal of Applied Behavior Analy-*

sis, 38, 89–100. http://dx.doi.org/10.1901/jaba.2005.161-02

*Penrod, B., Gardella, L., & Fernand, J. (2012). An evaluation of a progressive high-probability instructional sequence combined with low-probability demand fading in the treatment of food selectivity. *Journal of Applied Behavior Analysis, 45,* 527–537. http://dx.doi.org/10.1901/jaba.2012.45-527

*Penrod, B., & VanDalen, K. H. (2010). An evaluation of emerging preference for non-preferred foods targeted in the treatment of food selectivity. *Behavioral Interventions, 25,* 239–251. http://dx.doi.org/10.1002/bin.306

*Penrod, B., Wallace, M. D., Reagon, K., Betz, A., & Higbee, T. S. (2010). A component analysis of a parent-conducted multi-component treatment for food selectivity. *Behavioral Interventions, 25,* 207–228. http://dx.doi.org/10.1002/bin.307

Peterson, K. M., Ibañez, V. F., Kirkwood, C. A., Crowley, J. G., & Piazza, C. C. (2018). Assessment of pediatric feeding disorders. In J. L. Matson (Ed.), *Handbook of childhood psychopathology and developmental disabilities assessment: Autism and child psychopathology series* (pp. 415–431). Cham, Switzerland: Springer. http://dx.doi.org/10.1007/978-3-319-93542-3_22

Piazza, C. C., Fisher, W. W., Brown, K. A., Shore, B., Patel, M. R., Katz, R. M., . . . Blakely-Smith, A. (2003). Functional analysis of inappropriate mealtime behaviors. *Journal of Applied Behavior Analysis, 36,* 187–204. http://dx.doi.org/10.1901/jaba.2003.36-187

Piazza, C. C., Patel, M. R., Gulotta, C. S., Sevin, B. M., & Layer, S. A. (2003). On the relative contributions of positive reinforcement and escape extinction in the treatment of food refusal. *Journal of Applied Behavior Analysis, 36,* 309–324. http://dx.doi.org/10.1901/jaba.2003.36-309

*Pizzo, B., Coyle, M., Seiverling, L., & Williams, K. (2012). Plate A-plate B: Use of sequential presentation in the treatment of food selectivity. *Behavioral Interventions, 27,* 175–184. http://dx.doi.org/10.1002/bin.1347

*Rivas, K. M., Piazza, C. C., Roane, H. S., Volkert, V. M., Stewart, V., Kadey, H. J., & Groff, R. A. (2014). Analysis of self-feeding in children with feeding disorders. *Journal of Applied Behavior Analysis, 47,* 710–722. http://dx.doi.org/10.1002/jaba.170

*Rubio, E. K., Borrero, C. S. W., & Taylor, T. (2015). Use of a side deposit to increase consumption in children with food refusal. *Behavioral Interventions, 30,* 231–246. http://dx.doi.org/10.1002/bin.1404

Sharp, W. G., Volkert, V. M., Scahill, L., McCracken, C. E., & McElhanon, B. (2016). A systematic review and meta-analysis of intensive multidisciplinary intervention for pediatric feeding disorders: How standard is the standard of care? *The Journal of Pediatrics, 181,* 116–124. http://dx.doi.org/10.1016/j.jpeds.2016.10.002

*Silbaugh, B. C., & Swinnea, S. (2019). Failure to replicate the effects of the high-probability instructional sequence on feeding in children with autism and food selectivity. *Behavior Modification, 43,* 1–29. http://dx.doi.org/10.1177/0145445518785111

*Sira, B. K., & Fryling, M. J. (2012). Using peer modeling and differential reinforcement in the treatment of food selectivity. *Education & Treatment of Children, 35,* 91–100. http://dx.doi.org/10.1353/etc.2012.0003

Stubbs, K. H., Volkert, V. M., Rubio, E. K., & Ottinger, E. (2017). A comparison of flipped-spoon presentation and redistribution to decrease packing in children with feeding disorders. *Learning and Motivation, 62,* 103–111. http://dx.doi.org/10.1016/j.lmot.2017.03.007

*Taylor, T. (2018). Intensive paediatric feeding treatment and the use of a side deposit for a clinical case within the home setting in Australia. *European Journal of Behavior Analysis, 19,* 208–227. http://dx.doi.org/10.1080/15021149.2018.1472852

*Ulloa, G., Borrero, C. S. W., & Borrero, J. C. (2019). Behavioral interventions for pediatric food refusal maintain effectiveness despite integrity degradation: A preliminary demonstration. *Behavior Modification, 44,* 746–772. http://dx.doi.org/10.1177/0145445519847626

*VanDalen, K. H., & Penrod, B. (2010). A comparison of simultaneous versus sequential presentation of novel foods in the treatment of food selectivity. *Behavioral Interventions, 25,* 191–206. http://dx.doi.org/10.1002/bin.310

*Vaz, P. C. M., Volkert, V. M., & Piazza, C. C. (2011). Using negative reinforcement to increase self-feeding in a child with food selectivity. *Journal of Applied Behavior Analysis, 44,* 915–920. http://dx.doi.org/10.1901/jaba.2011.44-915

Volkert, V. M., Peterson, K. M., Zeleny, J. R., & Piazza, C. C. (2014). A clinical protocol to increase chewing and access mastication in children with feeding disorders. *Behavior Modification, 38,* 705–729. http://dx.doi.org/10.1177/0145445514536575

Volkert, V. M., & Piazza, C. C. (2012). Pediatric feeding disorders. In P. Sturmey & M. Hersen (Eds.), *Handbook of evidence-based practice in clinical psychology: Vol. 1. Child and adolescent disorders* (pp. 323–337). New York, NY: John Wiley & Sons.http://dx.doi.org/10.1002/9781118156391.ebcp001013

*Volkert, V. M., Piazza, C. C., & Ray-Price, R. (2016). Further manipulations in response effort or magnitude of an aversive consequence to increase self-feeding in children with feeding disorders.

Behavior Analysis in Practice, 9, 103–113. http://dx.doi.org/10.1007/s40617-016-0124-1

*Whelan, C. M., & Penrod, B. (2019). An evaluation of sequential meal presentation with picky eaters. *Behavior Analysis in Practice, 12,* 301–309. http://dx.doi.org/10.1007/s40617-018-00277-7

*Whipple, H., Scherr, R., & Kozlowski, A. M. (2020). Simultaneous presentation to decrease packing in a child with a feeding disorder. *Behavior Analysis in Practice, 13,* 197–204. http://dx.doi.org/10.1007/s40617-019-00360-7

Williams, K. E., Gibbons, B. G., & Schreck, K. A. (2005). Comparing selective eaters with and without developmental disabilities. *Journal of Developmental and Physical Disabilities, 17,* 299–309. http://dx.doi.org/10.1007/s10882-005-4387-7

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