A REVIEW OF THE USE OF ESCAPE EXTINCTION FOR THE REDUCTION OF INAPPROPRIATE MEALTIME BEHAVIOR

A Thesis

presented to

the Faculty of the Graduate School

at the University of Missouri-Columbia

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by GRACE MADDOX

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DECEMBER 2023
ESCAPE EXTINCTION FOR THE REDUCTION OF IMB

The undersigned, appointed by the dean of the Graduate School, have examined the thesis entitled

A REVIEW OF THE USE OF ESCAPE EXTINCTION FOR THE REDUCTION OF INAPPROPRIATE MEALTIME BEHAVIOR

presented by Grace Maddox, a candidate for the degree of Master of Science,

and hereby certify that, in their opinion, it is worthy of acceptance.

Professor Wesley Dotson

Professor Jessica Rodrigues

Professor Chad Rose
DEDICATION

I would like to thank my parents and brother for all their love and support through the years. I never could have made it without you. To Jacob, Lauren, and Michael- thank you for always being there to pick up my calls and for lifting my spirits with inside jokes and memes. Lastly, I would like to thank my colleagues and supervisors at the Thompson Center for all they have done to help keep me afloat these past two years.
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ACKNOWLEDGEMENTS

I would like to thank my committee, Dr. Wesley Dotson, Dr. Jessica Rodrigues, and Dr. Chad Rose for all their support and advice on this project. I would also like to thank Ethan Dultz for his help in completing IOA for this project.
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Food selectivity and inappropriate mealtime behaviors (IMB) can disrupt a child’s ability to consume the necessary calories and nutrients necessary for growth and development. This literature review examined whether escape extinction was a necessary treatment component for the treatment of IMB. Studies were included in the review if (a) the primary and secondary dependent variables were IMB or a behavior that is topologically equivalent (e.g., food refusal) and acceptance of solid food or liquids, and (b) the study compares an intervention utilizing escape extinction to an intervention that does not utilize escape extinction or an intervention that uses a different form of escape extinction. Studies were evaluated based on the following variables: types of treatment evaluated, most effective treatment, inclusion of a functional analysis, intervention setting, interventionist, and the inclusion of social validity measures. For all participants but one, some form of escape extinction was necessary to reduce IMB and increase food acceptance.
Introduction

Pediatric feeding disorder is defined as “impaired oral intake that is not age-appropriate, and is associated with medical, nutritional, feeding skill, and/or psychosocial dysfunction” (Goday et al, 2019). There are many risk factors associated with pediatric feeding disorders, including medical abnormalities in the gastrointestinal, cardiorespiratory, and neurological systems or neurodevelopmental disorders, such as autism spectrum disorder (ASD; Goday et al, 2019). Pediatric feeding disorder is often associated with IMB. IMB can take many forms, such as turning the head away, pushing utensils away, gagging, and negative vocalizations. IMB can also include accepting a bite of food, but not swallowing it, such as packing or expulsions. Because of the complex nature of pediatric feeding disorder, it is often necessary to collaborate with the child’s medical team, speech language pathologist, or occupational therapist to determine that intervention is safe for the child (Tereshko et al. 2021).

Food selectivity and IMB are especially prevalent in children with autism spectrum disorder (ASD). The Brief Autism Mealtime Behavior Index (BAMBI) is an 18-item assessment developed to systematically measure feeding problems common to children with ASD. Items on the BAMBI assess both food selectivity (“My child prefers the same foods at each meal.”) and IMB (“My child cries or screams during mealtimes.”) using a 5-point Likert scale. The initial study validating the BAMBI (Lukens & Linscheid, 2008) found that children with ASD scored higher on average than typically developing children indicating that children with ASD are more prone to IMB and food selectivity. Additionally, Johnson et al. (2014) found that an increase in IMB predicted nutritional inadequacy in children with autism spectrum disorder (ASD).
ABA Approaches to Understanding Inappropriate Mealtime Behavior

Behavior analytic interventions have been found to be effective in the treatment of IMB (Hodges et al. 2020). There are three main types of ABA-based intervention for IMB: assessment of function, extinction-based procedures, and non-extinction-based procedures.

ABA Assessments of Inappropriate Mealtime Behavior

Before an effective intervention can be designed, it is important to understand the function of the behavior. One way to determine the function of a behavior is through a functional analysis. The functional analysis was first developed by Iwata et al. (1982/1994) to determine the function of self-injurious behavior and has since been modified to determine the function of a variety of behaviors (Hanley et al. 2003). Piazza, Fisher et al. (2003) developed a methodology to determine the function of IMB. First, they observed the parents of six participants feeding their child as they would at home and took data on the consequences of IMB. All parents in the study provided attention (in the forms of reprimands, soothing comments, or coaxing) and escape following IMB. Three of the parents also provided access to tangibles such as preferred food, drink, or toys. In the second study, they conducted functional analyses using a reversal design to determine the function of IMB using the six participants from study 1 and nine new participants. In the baseline condition, toys and attention were presented noncontingently and bites were presented every 30 s with the verbal instruction “take a bite”. If the bite was not consumed, a new bite was presented after 30 s. If the child engaged in IMB, the bite was not removed. In the escape condition, no toys or attention were available. If IMB occurred, the bite was removed for the remainder of the 30-s interval. A new bite was presented at the end of the interval. In the attention condition, the bite remained at the mouth, but brief attention was given contingent on IMB. Lastly, in the tangible condition, the bite remained at the mouth, but access to preferred
food or toys was presented for the remainder of the 30-s interval. Three participants did not engage in IMB in any condition and another two participants did not engage in differentiated responding. Of the remaining ten participants, nine engaged in increased IMB in the escape condition relative to baseline and eight engaged in increased IMB in the attention condition relative to baseline. Two participants engaged in increased IMB in the tangible condition relative to baseline. Of the six participants in Study 1, the results of the direct observation matched the results of the functional analysis for three participants. One participant did not engage in IMB in the functional analysis, one did not engage in differentiated responding, and for the last participant, escape, attention, and access to tangibles were observed in the naturalistic observation, but only escape and access to tangibles were found to maintain IMB.

Borerro et al. (2010) conducted a descriptive analysis of IMB using 25 parent-child dyads that reported a history of IMB or food refusal. Experimenters observed parents conducting a meal as they would at home. Parents were provided with food that the child had previously accepted and food that the child had previously refused. If the parents requested toys or videos, these were also provided. Researchers collected data on parent and child behavior. Topographies of IMB included disruptive behavior, gagging or coughing, emesis (vomiting), expulsions, and problem behavior. Data was also collected on appropriate mealtime behavior (acceptance and sips). Parent behaviors included attention (coaxing, threats, reprimands, statements of comfort or concern, and praise); escape (spoon or drink removal, allowing the child to leave the table, and meal termination); and tangible delivery (delivery of leisure items, switching to a previously consumed food, switching to food after a drink presentation, and switching to drink after food presentation). Conditional and unconditional probability values were then calculated. The results
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showed that escape and attention were the most frequently observed consequences of food refusal.

Borrero et al. (2013) determined the level of correspondence between descriptive analyses and functional analyses of IMB using the descriptive analysis procedure of Borrero et al. (2010) and functional analysis procedure similar to Piazza et al. (2003). Overall correspondence between the assessments was 71%. Correspondence was greater for escape (100%) and attention (90%) functions and lower for tangible functions (50%). Results of the study were similar to Piazza, Fisher et al. (2003) in that the majority of participants had attention (9 participants of 10) and escape (10 participants of 10) functions and fewer had tangible functions (2 participants of 10).

In summary, functional analyses of IMB show that IMB is often maintained by escape. This is relevant because it indicates that an escape-based intervention is the most likely to be effective in treating IMB.

**Escape Extinction Interventions**

A common treatment for increasing food acceptance and reducing IMB is escape extinction (Piazza, Patel et al., 2003). Escape extinction is the non-removal of a task (in this case, accepting a bite of food) contingent on an inappropriate behavior that would normally lead to escape from that task (Cooper et al., 1995).

One of the most commonly used forms of escape extinction for IMB is nonremoval of the spoon (NRS). In an NRS procedure, a spoon is held at mouth-level until the bite is accepted. IMB is ignored. If NRS is not effective at increasing consumption of nonpreferred foods due to passive refusal, it may be necessary to introduce a physical prompt. Common physical prompts
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are side deposits (using a specialized spoon to insert the food into the cheek or onto the tongue), finger prompts (opening the mouth by inserting the index finger along the upper gum line) or jaw prompts (opening the mouth by applying gentle pressure to the mandibular joint) (Taylor, 2018; Taylor, 2020).

One concern with using extinction-based treatment is the possibility for the subject to engage in an extinction burst, which is described as an increase in the target behavior after it is put on extinction. While this burst is temporary, it can be serious and difficult to tolerate, especially if prolonged. Extinction bursts may also lead to lower rates of acceptability, especially by caregivers who are not well versed in behavior analytic principles (Woods & Borrero, 2019).

Non-escape Extinction Interventions

Although escape extinction is an effective treatment for increasing food acceptance and reducing IMB, it has low rates of parent acceptability relative to other treatment options (Vazquez et al., 2019; Tereshko et al., 2018). Non-extinction-based interventions for IMB include differential reinforcement of alternative behavior (DRA) and noncontingent reinforcement (NCR). These can be used independently of or in conjunction with escape extinction.

DRA is an intervention used by behavior analysts to decrease rates of an inappropriate behavior and increase rates of an appropriate replacement behavior by providing higher quality reinforcement for the replacement behavior than the original target behavior. In the case of IMB, reinforcement in the form of praise, access to preferred leisure items, or preferred food is given when the individual accepts a bite of the non-preferred food, but not when the individual engages in IMB (Piazza, Patel et al., 2003; de los Santos & Silbaugh, 2020).
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NCR is an intervention where access to attention and/or preferred items is given freely throughout the session (Reed et al., 2004). Cooper et al. (2005) found that for one participant NCR and escape extinction were both necessary to increase food acceptance. NCR may reduce the likelihood of an extinction burst (an increase in responding after a behavior is put on extinction) which is common in extinction protocols (Reed et al., 2004).

Purpose and Research Question

While previous literature reviews have examined the effectiveness of feeding protocols without the use of escape extinction (Tereshko et al. 2021), no review has directly compared the effectiveness of escape extinction to other treatment components. Behavior analysts should strive to select interventions that are effective and have high social validity. While non-extinction-based interventions have a higher approval rating relative to extinction-based treatment, it is unclear whether they are as effective. The present literature review seeks to determine whether escape extinction is a necessary treatment component for individuals engaging in IMB.

Methods

Search Methodology

A search was conducted using Google Scholar using the search terms “comparison AND ("food refusal" OR "food selectivity" OR "pediatric feeding disorder" OR "inappropriate mealtime behavior") AND "escape extinction" AND ("positive reinforcement" OR "negative reinforcement" OR "noncontingent reinforcement") AND ASD”. ASD was included in the search terms, because the initial focus of this review was the treatment of IMB in children with ASD. However, due to a lack of available articles focusing on children with ASD, studies that
had participants with diagnoses other than ASD were also included. Searches were also conducted using the same search terms on PubMed and ERIC, which returned no results.

First, a title and abstract scan was conducted to determine which articles were empirical or nonempirical. Next, the methods and results sections of each empirical article were scanned to determine if the article met inclusion criteria. The majority of articles were available through Google Scholar and any articles not publically available were accessed through interlibrary loan.

**Inclusion and Exclusion Criteria**

Studies were included in the review if (a) the primary and secondary dependent variables were IMB or a behavior that is topologically equivalent (e.g., food refusal) and acceptance of solid food or liquids, and (b) the study compares an intervention utilizing escape extinction to an intervention that does not utilize escape extinction or an intervention that uses a different form of escape extinction. Studies were excluded from the review if (a) they were not written in English or (b) the primary research question was related to caregiver training.

**Variables of Interest**

Studies were evaluated based on the following variables: types of treatment evaluated, most effective treatment, inclusion of a functional analysis, intervention setting, interventionist, and the inclusion of social validity measures.

The treatments evaluated were included based on treatments listed in the methods section of each study. Effective treatments were determined based on visual analysis of the graphs presented in each study. A treatment was considered effective if it both reduced IMB and increased acceptance. A treatment that was effective at decreasing IMB but not increasing
acceptance would fail to meet the ultimate goal of the child being able to consume a variety of foods and acquire necessary nutrients and calories.

If a functional analysis was included as part of the study, the results of the functional analysis were included. This variable was included to determine whether the use of functional analysis was necessary for escape extinction to be effective.

Intervention setting and interventionist were reported as listed in the method section of each study. Social validity measures were listed as reported in the results and discussion sections of each study. These variables are significant because they determine if the treatment can be generalized to a child’s natural environment.

**Reliability**

A secondary evaluator independently evaluated the inclusion or exclusion on 34% empirical articles identified. The selection of papers given to the second evaluator included both articles that have been included and articles that have been excluded from the study by the primary evaluator (author). Interobserver agreement (IOA) was calculated by dividing the number of articles with agreement about inclusion or exclusion by the total number of articles evaluated by both people. In cases where there is disagreement, the two evaluators discussed the article and made a decision on its inclusion.


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Results

The initial search yielded 583 results. 272 of these results were empirical studies written in English. Of these studies, 15 met criteria for inclusion. A summary of each study can be found in table 1. The secondary evaluator evaluated 93 studies. A disagreement was found for six studies for an agreement of 93.5%. After discussion, both evaluators were in 100% agreement with the studies included in this review.

Casey et al. (2009) evaluated delivering praise on a variable ratio (VR)2 or fixed ratio (FR)1 schedule and delivering praise on an FR1 schedule with NRS both with and without 15-minute meals. Praise FR1 + NRS + 15 Minute Meals was found to be the most effective treatment.

Fernand et al. (2016) evaluated the availability of choice to increase food acceptance. In the Choice 1 condition, the participant was presented with four target foods and was asked to select two. In the Choice 2 condition, one of the target foods in the initial array was replaced with a more preferred food. Researchers also evaluated Choice 1 + NRS and NRS. For one participant, Choice 1 + NRS and NRS were effective in increasing the number of bites consumed and decreasing IMB. For the other participant, Choice 1, and Choice 1 + NRS were effective in increasing the number of bites consumed and decreasing IMB.

Kadey et al. (2013) compared NRS to NRS + NCR and NRS + NCR + Nuk Prompt. The Nuk Prompt consisted of the feeder using a Nuk brush by inserting it between the cheek and teeth and turning it approximately 10 degrees to open the child’s mouth. NRS and NRS + NCR were successful in reducing IMB, but not initially successful in increasing active acceptance. The
addition of the Nuk prompt led to an increase in active acceptance which. In the reversal to NRS + NCR and to baseline, acceptance stayed high and IMB remained low.

Kirkwood et al. (2021) used a multielement design to compare escape extinction with and without attention extinction. Across all participants, escape extinction was effective in reducing IMB and increasing acceptance with and without attention extinction.

Kozlowski et al. (2016) compared the effectiveness of DRA to DRA + nonremoval of the cup (NRC) in increasing acceptance of nutritional beverages. DRA + NRC was effective in increasing acceptance of the liquid and decreasing IMB.

McHugh (2019) compared two ABA-based interventions (simultaneous presentation + NRS and sequential presentation + NRS) to a non-ABA intervention (modified food chaining). Both ABA treatments were successful in increasing acceptance of the target food. Notably, neither participant contacted the escape extinction contingency, although the rule was given at the start of each session.

Rubio (2021) examined the use of NRS with DRA or NCA, NRS + DRA or NCA and a finger prompt, and NRS + DRA or NCA plus a spoon prompt. Both the finger and spoon prompts were effective in increasing acceptance. Two of the three caregivers preferred the finger prompt, but all therapists viewed the finger prompt as more invasive.

Schutt (2021) compared NRS to NRS + NCR. Differentiated responding was not observed in one participant and NRS + NCR was shown to be effective at increasing bite acceptance and decreasing IMB for the other participant. The caregiver of the participant for whom NRS and NRS + NCR were both effective preferred the NRS alone procedure, because it was more similar to a naturalistic meal.
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Sharp et al. (2019) evaluated Escape + NCA, NRS + NCA, NRS + NCA + representation of bites (REP) and NRS + DRA + REP and found that NRS + DRA + REP was most effective.

Silbaugh & Swinnea (2018) evaluated the use of NRS + a chaser, NRS + redistribution (RED), NRS + pureed food only, and NRS + chaser + DRA + instructions to decrease packing. NRS + chaser + DRA + instructions were found to be effective. Caregiver satisfaction averaged 4.5 on a 5-point scale.

Taylor T. (2018) evaluated differential attention (DA) + contingent access (CA), DA + CA + NRS & REP; DA + CA + NRS & REP + finger prompt & side deposit and found that DA + CA + NRS & RE + finger prompt & side deposit was most effective.

Taylor T. (2020) evaluated CA + DA; CA + DA + NRS & REP; CA + DA + NRS & RE + finger prompt; CA + DA + NRS & REP + finger prompt + side deposit and found that CA + DA + NRS & RE + finger prompt + side deposit was most effective.

Taylor T. (2021) evaluated NCA; NCA + CA & DA; NCA + CA & DA + NRS & REP; and DA + NRS & REP + RED and found that CA + DA + NRS & REP + RED was most effective.

Taylor T. (2022) evaluated NCA, CA + DA; CA + DA + NRS & REP; and CA + DA + NRS & REP and found that CA + DA + NRS & REP was most effective.

Summaries of treatment components and other treatment variables can be found in tables 2 and 3. All studies used some form of NR (NRS: 14; NRC: 2). 5 included representation. 6 studies used some form of physical prompt. The most commonly used physical prompt was a finger prompt (3 studies), followed by a side deposit (2 studies). A Nuk prompt and a spoon
prompt were evaluated in one study each. The most common non-extinction treatment components were NCR (eight studies) and DRA (seven studies).

For all participants but one, some form of escape extinction was necessary to reduce IMB and increase food acceptance. Of the 15 studies, five evaluated the use of escape extinction alone with a total of nine participants. Escape extinction (NRS) alone was effective for five of these participants. For one of these participants, NRS alone was not effective but a treatment option without escape extinction was (Choice 1; Fernand et al. 2016). No studies evaluated a physical prompt as the sole treatment component.

Of the studies, only two included a functional analysis (Kirkwood et al. 2021; Smith et al, 2019). In both studies, the function of IMB was determined to be escape. An additional study (Kozlowski et al. 2016) included the results of a functional analysis conducted prior to the study for a similar topography of behavior (refusal of solids vs refusal of liquids). They found that IMB was maintained by escape and attention for one participant and escape, attention, and access to tangibles for the other participant. Despite the lack of functional analyses in the other studies, escape extinction was found to be a necessary treatment component.

Seven of the studies were conducted in a clinic and seven were conducted in the participants' homes. One study did not report the setting. The majority of studies (14) were conducted by therapists and two studies were conducted by caregivers. An additional four studies conducted caregiver training after the conclusion of the study.

For studies that reported caregiver acceptability, caregivers reported high satisfaction with the treatment outcomes and procedures. One caregiver reported that they preferred NRS alone to NRS + NCR as it was more similar to a naturalistic mealtime environment (Schutt 2021).
Rubio (2021) reported that most caregivers preferred the finger prompt to the spoon prompt and perceived it as less invasive, while all therapists viewed the finger prompt as more invasive. The study gave several possible explanations for this. First, the spoon prompt was commonly used in the clinic and therapists may have been more comfortable with it due to more exposure. Secondly, although the caregivers rated the acceptability of each prompt before and after seeing it performed, they did not perform it themselves in the course of the study. Thirdly, therapists may have safety concerns using the finger prompt due to the possibility of being bitten.

**Discussion**

The purpose of this review was to determine whether escape extinction was necessary for the treatment of IMB. Of the studies included in this review, escape extinction was a component of effective treatment, indicating that it is a necessary treatment component. Although almost every effective treatment involved some form of escape extinction, only five studies evaluated escape extinction alone as a treatment option. One reason for this may be that caregivers may find the use of escape extinction alone unacceptable (Allison et al. 2013) but are more willing to use it paired with other more acceptable treatment options such as DRA. Of the eight participants for whom NRS alone was evaluated, it was effective for five of them, indicating that NRS alone is sufficient for some individuals, but not all. Further research evaluating the effectiveness of escape extinction alone may be beneficial.

**Inclusion of Functional Analysis**

Escape extinction was both effective and necessary for almost all participants regardless of the inclusion of a functional analysis. This supports the findings of Piazza et al. (2003) and Borrero et al. (2010) which showed that in the majority of cases, IMB is maintained by negative
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reinforcement. Piazza et al. (2003) and Borrero et al. (2010) also showed that IMB is often maintained by positive reinforcement in the form of attention and occasionally by access to tangibles. The inclusion of other treatment components such as DRA and NCR may account for the effectiveness of treatment programs in cases where IMB is multiply maintained. Future research may further explore the necessity for functional analyses in the treatment of functional behavior and whether escape extinction alone is sufficient for treating IMB controlled by multiple functions of behavior.

Intervention Setting and Interventionist

The vast majority of studies were conducted by therapists with only two studies being conducted by caregivers. Roughly half of the studies (seven) were conducted in the participants’ homes. One goal of feeding protocols should be generalization to the client’s natural environment. It is important to program for this generalization by training caregivers and conducting programs in the client’s home when possible. While it is possible that caregivers were trained in the protocols following the study, only four studies explicitly stated this. Caregiver training may also affect caregiver acceptability. Caregivers may find a protocol satisfactory in clinic when it is run by a therapist but struggle to run the same protocol with fidelity at home. Further research should be done to train caregivers to conduct escape extinction in more naturalistic settings. Additionally, researchers should examine the impact of caregiver training on caregiver acceptability.

Caregiver Acceptability

Across the studies, caregivers were satisfied with the use of escape extinction on their children’s mealtime behaviors. One caregiver even noted that they preferred escape extinction alone when both escape extinction alone and escape extinction + NCR were equally effective
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(Schutt, 2021). This is interesting as it contradicts previous research that indicated that caregivers are more likely to find non-escape extinction procedures more acceptable than escape extinction procedures (Woods & Borrero 2019). Future research could examine whether inclusion of other components increases caregiver acceptability of escape extinction procedures.

Limitations

A limitation of this review is that using different search terms may have yielded different results. In particular, use of the term “comparison” may have been limiting as studies that did not contain this word may have met inclusion criteria. Additionally, omitting “ASD” from the search terms may have yielded more articles that met the inclusion criteria, but did not include children with ASD as participants. The lack of articles focusing on the use of escape extinction for the treatment of IMB in children with ASD is a limitation itself. More research should be conducted with this population.

When designing programs to reduce IMB and increase acceptance of target foods, behavior analysts should consider using NRS with another treatment component such as DRA or NCR. While conducting a functional analysis may be helpful to confirm the function of the behavior, escape extinction interventions can be effective without confirming an escape function. The use of DRA, NCR, or some other treatment component may account for other functions of behavior and reduce the likelihood of extinction burst (Vasquez et al. 2019). Lastly, if NRS is not effective, it may be necessary to include some form of physical prompting. Practitioners should use caution and set termination criteria for such protocols (Tereshko et al. 2021).

IMB is a serious concern as it can negatively impact a child’s ability to get much needed calories and nutrients which are vital for a child’s growth and development. Although behavior analysts can be effective in the treatment of IMB, it is always important to confer with other
professionals such as physicians, nutritionists, and speech pathologists to rule out underlying conditions such as food intolerances and swallowing difficulties. As with all programs, it is important to consider what treatment will be acceptable to parents as well as feasible for them to run.
### Table 1

#### Summary of Studies

<table>
<thead>
<tr>
<th>Studies in Alphabetical Order</th>
<th>Participants</th>
<th>Interventions Evaluated</th>
<th>Effective Treatment(s)</th>
<th>Functional Analysis Results</th>
<th>Setting</th>
<th>Interventionist</th>
<th>Social Validity Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casey et al., 2009</td>
<td>35-month-old female: other medical; 10-month-old female: other medical</td>
<td>Praise VR2, Praise FR1, Praise FR1 + NRS, Praise FR1 + NRS + 15 Minute Meals</td>
<td>Praise FR1 + NRS + 15 Minute Meals</td>
<td>N/A</td>
<td>Home</td>
<td>Therapist, Caregiver</td>
<td>N/A</td>
</tr>
<tr>
<td>Fernand et al., 2016</td>
<td>6-year-old female: ASD, 7-year-old male: ASD</td>
<td>Choice 1, Choice 2, Choice 1 + NRS, NRS</td>
<td>Choice 1 + NRS, NRS; Choice 1, Choice 1 + NRS</td>
<td>N/A</td>
<td>N/A</td>
<td>Therapist</td>
<td>N/A</td>
</tr>
<tr>
<td>Kadey et al., 2013</td>
<td>3-year-old male: ASD</td>
<td>NRS, NRS+ NCR; NRS + NCR + Nuk Prompt</td>
<td>NRS + NCR + Nuk Prompt</td>
<td>N/A</td>
<td>Clinic</td>
<td>Therapist</td>
<td>N/A</td>
</tr>
<tr>
<td>Kirkwood et al., 2021</td>
<td>3-year-old male: ASD, other medical; 5-year-old female: other medical; 3-year-old female: other medical</td>
<td>NRS, NRS + Attention Extinction</td>
<td>NRS, NRS + Attention Extinction</td>
<td>Escape</td>
<td>Clinic</td>
<td>Therapist</td>
<td>Caregiver Questionnaire</td>
</tr>
<tr>
<td>McHugh, 2019</td>
<td>3-year-old: ASD; 5-year-old: ASD</td>
<td>Simultaneous Presentation + NRS; Sequential Presentation + NRS, Modified Food Chaining</td>
<td>Acceptance: Simultaneous Presentation + NRS; Sequential Presentation + NRS IMB: Low across all conditions</td>
<td>N/A</td>
<td>Clinic</td>
<td>Therapist</td>
<td>N/A</td>
</tr>
<tr>
<td>Kozlowski et al., 2016</td>
<td>3-year-old: other medical; 4-year-old: other medical; 5-year-old: ASD, other medical</td>
<td>DRA, DRA + NRC</td>
<td>DRA + NRC</td>
<td>Escape, Tangible, and Attention (based on FA for solids); Escape and Attention (based on FA for solid), N/A</td>
<td>Clinic</td>
<td>Therapist</td>
<td>N/A</td>
</tr>
<tr>
<td>Rubio, 2021</td>
<td>4-year-old male: ASD, other medical; 2-year-old female: other medical; 5-year-old male: Down syndrome, other medical</td>
<td>NRS with DRA or NCA; NRS with DRA or NCA plus finger prompt, NRS with DRA or NCA plus spoon prompt</td>
<td>NRS with DRA or NCA plus finger prompt/spoon prompt</td>
<td>N/A</td>
<td>Clinic</td>
<td>Therapist</td>
<td>N/A</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Reference</th>
<th>Age/Group</th>
<th>Intervention Details</th>
<th>Setting</th>
<th>Provider(s)</th>
<th>Measure(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schutt, 2021</td>
<td>8-year-old male: ASD 3-year-old male: ASD</td>
<td>NRS, NRS + NCR</td>
<td>N/A</td>
<td>Home</td>
<td>Caregiver Questionnaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NRS, NRS + NCR; NRS + NCR</td>
<td></td>
<td>Caregiver</td>
<td></td>
</tr>
<tr>
<td>Sharp et al., 2010</td>
<td>17-month-old female: other medical</td>
<td>Esc + NCA, NRS + NCA, NRS + NCA + REP, NRS + DRA + REP</td>
<td>N/A</td>
<td>Clinic</td>
<td>Therapist, Parent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NRS + DRA + REP</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Silbaugh &amp; Swinnea, 2019</td>
<td>5-year-old female: ASD</td>
<td>NRS + Chaser, NRS + RED, NRS + Puree Only, NRS + Chaser + DRA + Instructions</td>
<td>N/A</td>
<td>Home</td>
<td>Therapist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NRS + Chaser + DRA + Instructions</td>
<td></td>
<td>N/A</td>
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</tr>
<tr>
<td>Smith et al., 2019</td>
<td>4-year-old male: ASD, other medical</td>
<td>NRC, NRC+NCA to music</td>
<td>NRS + NCA</td>
<td>Escape</td>
<td>Clinic, Therapist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Taylor, 2018</td>
<td>9-year-old male: other medical.</td>
<td>DA + CA, DA + CA + NRS &amp; REP, DA + CA + NRS &amp; REP + FP &amp; SD, CA + DA + NRS &amp; REP</td>
<td>N/A</td>
<td>Home</td>
<td>Therapist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td>Caregiver Training</td>
</tr>
<tr>
<td>Taylor, 2020</td>
<td>5-year-old male: ASD; 4-year-old male: ASD</td>
<td>CA + DA, CA + DA + NRS &amp; REP, CA + DA + NRS &amp; REP + FP &amp; SD, CA + DA + NRS &amp; REP + FP &amp; SD</td>
<td>N/A</td>
<td>Home</td>
<td>Therapist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Therapist</td>
<td>Caregiver Questionnaire</td>
</tr>
<tr>
<td>Taylor, 2021</td>
<td>5-year-old male: ASD, other medical; 4-year-old female: ASD, other medical</td>
<td>NCA, NCA + CA &amp; DA, NCA + CA &amp; DA + NRS &amp; REP, CA &amp; DA + NRS &amp; REP, CA &amp; DA + NRS &amp; REP + RED</td>
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<td>Home</td>
<td>Therapist</td>
</tr>
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<td>Therapist</td>
<td>Questionnaire, Caregiver Training</td>
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<tr>
<td>Taylor 2022</td>
<td>5-year-old: ASD, other medical</td>
<td>NCA, NCA + CA &amp; DA, NCA + CA &amp; DA + NRS &amp; RE, CA &amp; DA + NRS &amp; RE, CA &amp; DA + NRS &amp; RE + RED</td>
<td>N/A</td>
<td>Home</td>
<td>Therapist</td>
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<td>Therapist</td>
<td>Caregiver Training, Questionnaire</td>
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</table>

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Table 2

Summary of Treatment Components

<table>
<thead>
<tr>
<th>Treatment Component</th>
<th>Number of Studies that Evaluated Component (Number of Studies in which the Component was Effective)</th>
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<tbody>
<tr>
<td>Escape Extinction</td>
<td>15 (15)</td>
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<tr>
<td>NRS</td>
<td>13 (13)</td>
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<tr>
<td>NRC</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Side Deposit</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Spoon Prompt</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Finger Prompt</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Nuk Prompt</td>
<td>1 (1)</td>
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<tr>
<td>Representation</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Redistribution</td>
<td>2 (1)</td>
</tr>
<tr>
<td>DRA</td>
<td>7 (7)</td>
</tr>
<tr>
<td>NRS</td>
<td>8 (5)</td>
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<tr>
<td>Choice</td>
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<tr>
<td>Simultaneous Presentation</td>
<td>1 (1)</td>
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<tr>
<td>Sequential Presentation</td>
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<tr>
<td>Modified Food Chaining</td>
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<tr>
<td>Attention Extinction</td>
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<tr>
<td>Praise VR2</td>
<td>1 (0)</td>
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<tr>
<td>Praise FR1</td>
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<tr>
<td>Chaser</td>
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<tr>
<td>Puree Only</td>
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Table 3

*Summary of Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Studies</th>
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<tbody>
<tr>
<td>Treatment Setting: Home</td>
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<tr>
<td>Treatment Setting: Clinic</td>
<td>7</td>
</tr>
<tr>
<td>Interventionist: Therapist</td>
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<td>Interventionist: Caregiver</td>
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<tr>
<td>Functional Analysis</td>
<td>2</td>
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</table>
ESCAPE EXTINCTION FOR THE REDUCTION OF IMB

References


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Schutt, D. J. (2021). An evaluation of nonremoval of the spoon with and without noncontingent reinforcement to decrease inappropriate mealtime behavior (Doctoral dissertation, California State University, Sacramento).


ESCAPE EXTINCTION FOR THE REDUCTION OF IMB
