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# Research in Autism Spectrum Disorders

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## A systematic review of interventions for feeding-related behaviors for individuals with autism spectrum disorders

Jennifer R. Ledford<sup>a,\*</sup>, Erinn Whiteside<sup>b</sup>, Katherine E. Severini<sup>a</sup><sup>a</sup> Vanderbilt University, 228 Peabody, Vanderbilt University, Nashville, TN 37203, United States<sup>b</sup> University of Georgia, School of Education, Aderhold Hall, Athens, GA 30602, United States

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### ABSTRACT

**Background:** Feeding problems are common for individuals with ASD. Researchers have most often used single case designs, a type of design appropriate for evaluating causal relations, to assess feeding interventions. Previous reviews of effectiveness have included only peer-reviewed studies (e.g., did not include gray literature) and have not analyzed outcomes via the presence of functional relations, the primary analysis method for single case research.

**Method:** Authors reviewed peer-reviewed and non-peer-reviewed sources including studies designed to improve mealtime behaviors for individuals with autism spectrum disorder (ASD) to determine participant characteristics, common intervention characteristics and components, and success rates (percentage of studies with functional relations).

**Results:** Studies often included individuals with ASD who were highly selective; common dependent variables were acceptance of food and problematic mealtime behaviors. Researchers, rather than indigenous adults, most often implemented studies in clinics, rather than typical settings. Interventions designed to improve acceptance had higher success rates (percentage of studies demonstrating a functional relation) than those targeting rumination/vomiting or problematic mealtime behavior.

**Conclusions:** Outcomes were more often positive for food acceptance and less often positive for problematic mealtime behavior. More research is needed, particularly in typical contexts with indigenous implementers and including component analyses, feasibility assessment, and social validity measurement. Feeding interventions should be selected based on identified caregiver priorities (e.g., focus on problematic mealtime behavior or food acceptance) and should include consideration of behavioral function and less restrictive interventions.

## 1. Introduction

Feeding problems are more common for individuals with ASD than for their siblings, nonfamilial typically developing individuals, and individuals with other disabilities (Curtin et al., 2015; Nadon, Feldman, Dunn, & Gisel, 2011; Sharp et al., 2013). Feeding problems can cause nutritional deficits (Sharp et al., 2013) and can result in significant burdens for families (Curtin et al., 2015). Most feeding problems for individuals with ASD can be characterized as a manifestation of restricted and repetitive behaviors (Johnson et al., 2014). For example, individuals might restrict the number of different foods eaten (food selectivity) and might engage in challenging behavior when different foods are presented (problematic mealtime behavior). Some individuals with ASD might engage in repetitive behaviors associated with eating, such as regurgitating food (rumination or vomiting) or keeping food in the mouth for

\* Corresponding author.

E-mail address: [jennifer.ledford@vanderbilt.edu](mailto:jennifer.ledford@vanderbilt.edu) (J.R. Ledford).

extended periods of time (packing). Behavioral treatment approaches are the most commonly assessed intervention type for addressing feeding behaviors (Sharp, Jaquess, Morton, & Hertzinger, 2010); this is appropriate because caregivers may reinforce these behaviors from a very early age and over long periods of time, via escape from feeding-related demands, access to preferred foods, or attention from caregivers (Borrero, Woods, Borrero, Masler, & Lessler, 2010; Kerzner et al., 2015).

In 2006, Ledford and Gast proposed that a lack of research on feeding problems for individuals with ASD may be due to the relatively low medical risk of these problems. For example, many individuals with ASD who eat restricted diets may have adequate caloric intake (Zimmer et al., 2012). However, recent guidelines published in *Pediatrics* (Kerzner et al., 2015) suggest that even mild feeding problems should be addressed. They classified children who accepted less than 10–15 foods as highly selective with the potential for nutritional deficits and children eating more than 15 but fewer than “average” as mildly selective, with primary difficulties around family discord and conflict (Kerzner et al., 2015 p. 348).

Reviews have reported that restrictive procedures are commonly used to address feeding problems. For this review, we define restrictive procedures as those that involve limiting an individual’s movement (e.g., using a seat belt to prevent a child from leaving a seat; using physical prompting) or those that include interventions that require children to respond prior to session completion (e.g., staying at a table until 10 bites are taken, potentially resulting in long session duration during initial intervention implementation). One common procedure that may be considered restrictive is nonremoval of the spoon, a procedure during which an implementer presents a spoon or cup near an individual’s mouth until they open their mouth, at which time the implementer deposits the food or drink. A similar procedure is re-presentation, during which an implementer scoops a bit that was expelled (i.e., spit out) and places it back in the individual’s mouth. These procedures are often implemented as a package. The extent to which practitioners use restrictive treatments is unclear; more restrictive procedures may be more socially valid if participants are highly selective and potentially at risk for nutritional problems. However, less restrictive procedures, if efficacious, may be needed for implementation outside of clinical contexts (e.g., in typical settings such as schools).

Since the Ledford and Gast (2006) article, several reviews have described the state of intervention for feeding problems of individuals with ASD (Marshall, Ware, Ziviani, Hill, & Dodrill, 2015; Silbaugh et al., 2017) or including individuals with ASD (Sharp et al., 2010). These reviews generally noted positive outcomes for behavioral interventions designed to improve feeding behaviors, although Marshall et al. noted a greater proportion of positive outcomes and a greater magnitude of effects for improving food selectivity and less positive outcomes for problematic mealtime behaviors. It is difficult to interpret outcomes from these reviews, because they either included both experimental and nonexperimental designs (e.g., A-B and A-B-A-B designs) when reporting outcomes, interpreted effect sizes without reporting on the presence of functional relations (see Ledford, 2018; Ledford, Lane, & Severini, 2018 for a discussion of why this is problematic), or did not include gray literature.

The purpose of this review is to describe the state of feeding research for individuals with ASD; it is distinct from previous reviews in several ways. First, we adhered to contemporary guidelines for reviews. Specifically, we used no date restrictions, and we explicitly searched for unpublished dissertations. This inclusion of gray literature reduces the likelihood of bias due to the decreased likelihood of publication of highly rigorous studies with non-effects (Shadish, Zeligsky, Vevea, & Kratochwill, 2016). Second, we conducted analysis of outcomes at the design level rather than the article level. This allows for determination of experimental effects for each opportunity to do so, rather than providing article-level summary statistic (see Ledford, Lane, & Tate, 2018). For example, it may be critical that an intervention was effective in one A-B-A-B design for one participant or dependent variable but ineffective for another A-B-A-B design with a second participant or dependent variable. In addition, we describe the body of research as a whole, but include outcomes analysis only for designs with adequate quality and rigor (What Works Clearinghouse [WWC], 2017). This ensured that non-peer-reviewed studies were only assessed if they met contemporary rigor standards, and prevented low-rigor studies (peer-reviewed and non-peer-reviewed) from impacting the conclusions drawn about outcomes, since results from these studies might be attributable to history effects, maturation, or other threats to internal validity. Finally, we visually analyzed and coded outcome data with regard to whether there was demonstration of a functional relation, as recommended for single case reviews (Moeyaert, Zimmerman, & Ledford, 2018). Because the presence of a functional relation is the primary means by which single case data are analyzed, and because the use of statistical metrics may not align with functional relation determination, this metric improves the interpretability of results.

The guiding research questions were: (a) What types of interventions have researchers evaluated for individuals with ASD related to mealtime behaviors, and what types of dependent variables have they addressed? (b) Who implemented study procedures, and in what settings were the studies conducted? (c) What were the outcomes, and are they different across independent and dependent variable types, settings, or implementers?

## 2. Method

The first author and primary coder, an expert in single case designs with a PhD in Special Education and certification as a doctoral-level behavior analyst (BCBA-D), conducted a systematic search to identify intervention studies for feeding-related mealtime behaviors for individuals with ASD using PubMed, PsycINFO, and ProQuest Dissertations and Theses databases; the third author conducted an independent search for the purposes of establishing agreement on inclusion of appropriate studies, with disagreements settled via consensus (99%; agreements on inclusion or exclusion divided by total number of studies). Without year or publication restrictions, authors searched using the following string of terms: (autis\* OR pervasive OR Asperger OR “developmental disorder”) AND (feeding OR eating OR “food choice” OR “food selectivity” OR “food refusal” OR “food acceptance” OR “mealtime NEAR/3 behavior” OR tolera\* OR texture OR “food type”) AND (intervention OR treatment OR “non-removal of the spoon” OR “escape extinction” OR representation OR shaping OR fading). Table 1 lists inclusion and exclusion criteria (based on PICOS criteria;

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