

USING A CHASER TO DECREASE PACKING IN CHILDREN WITH FEEDING DISORDERS

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Packing is a problematic mealtime behavior that is characterized by pocketing or holding solids or liquids in the mouth without swallowing. In the current study, we examined the effects of a chaser, a liquid or solid consistently accepted and swallowed by the child, to decrease packing of solid foods in 3 children with feeding disorders. During the chaser procedure, the therapist presented the chaser immediately for 2 children or 15 s after each bite presentation for 1 child. The chaser was effective in decreasing packing for all 3 children. The results are discussed in terms of the clinical importance of the findings and directions for future research.

Key words: chaser, feeding disorders, packing, pediatric feeding disorders

Packing, defined as holding or pocketing solids or liquids without swallowing, is a behavior that is exhibited by children with feeding problems (e.g., Gulotta, Piazza, Patel, & Layer, 2005; Patel, Piazza, Layer, Coleman, & Swartzwelder, 2005; Riordan, Iwata, Wohl, & Finney, 1980; Sevin, Gulotta, Sierp, Rosica, & Miller, 2002). Packing is problematic for a number of reasons. First, packing increases the risk for aspiration because it may result in premature spillage of solids or liquids into the airway in the absence of swallow preparation (Logemann, 1998). Second, Gulotta et al. (2005) showed that packing may be associated with reduced intake, which may lead to dehydration or malnutrition. Finally, packing may be associated with excessive meal length, which may interfere with other activities (e.g., doctor's appointments, the arrival of the school bus) and cause mealtime to be stressful for caregivers.

Investigators have evaluated the efficacy of a variety of procedures as treatment for packing. The procedures that have received the most attention in the literature include manipulations of presented food (Mueller, Piazza, Patel, Kelley, & Pruett, 2004; Patel et al., 2005) and redistribution. Mueller et al. (2004) evaluated the effects of blending preferred and nonpreferred foods on mouth clean, which is the converse of packing. Mouth clean is a product measure of swallowing, defined by Mueller et al. as no food in the child's mouth 30 s after the bite entered the child's mouth. Mouth clean of nonpreferred food gradually increased, and packing gradually decreased, when nonpreferred food was blended with preferred food. The ratio of nonpreferred to preferred food was increased gradually until the feeder presented the nonpreferred food without the preferred food. All children continued to consume the nonpreferred food in the absence of the preferred food. Patel et al. (2005) evaluated the extent to which packing was associated with different textures of food (e.g., pureed, wet ground, chopped). All three children in the Patel et al. study had lower

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doi: 10.1901/jaba.2012.45-97

levels of packing and higher numbers of grams consumed when the texture of presented foods was decreased.

Redistribution involves removing packed food from the child's mouth and placing it back into the mouth on the tongue. Sevin *et al.* (2002) and Gulotta *et al.* (2005) used a Nuk brush and Volkert, Vaz, Piazza, Frese, and Barnett (2011) used a flipped spoon to redistribute packed food. The Nuk brush procedure consisted of rolling the brush with the previously packed food onto the middle of the child's tongue to deposit the food. The flipped spoon procedure consisted of flipping the spoon with the previously packed food 180° and then dragging the bowl of the spoon along the tongue toward the lips to deposit the food. In all cases, redistribution with either the brush or the flipped spoon resulted in decreased packing.

One limitation of blending, texture manipulations, and redistribution is that they are not procedures that are used with typically eating children. However, these interventions may be necessary for children with feeding problems when packing is the behavior of concern. That is, it may be necessary to deviate from common feeding practices to treat a feeding problem effectively, particularly when the consequences of the feeding problem are potentially serious, as in the case of packing. Another limitation of blending, texture manipulation, and redistribution is that the procedures may be cumbersome (e.g., blending) or difficult (e.g., redistribution) for caregivers to implement. Therefore, it might be preferable for interventions to be more similar to the feeding practices of typically eating children if these interventions are to be effective.

One method that some typically eating individuals use to assist them in swallowing more difficult textures or consistencies of food is to follow bites of solids with liquids or to follow a difficult food (e.g., steak) with a bite of a smoother food (e.g., creamy mashed potatoes), which we will refer to as a chaser. For example, although a child may consume a peanut butter

sandwich with milk for a variety of reasons, one benefit of the combination is that the milk assists with swallowing the peanut butter. Alternating solids with liquids is a strategy that is used to facilitate swallowing in patients with dysphagia (Logemann, 1998), and this technique is recommended commonly by speech-language pathologists for patients with dysphagia. However, to our knowledge no studies have determined empirically whether chasers are helpful in decreasing packing in children with feeding disorders. In the current study, we assessed the effectiveness of a chaser with three children who packed specific solid foods, which we called target foods. We identified liquids for two children and a solid for one child that they swallowed consistently, which we called the chaser. We then evaluated whether following the bites of target food with the chaser would reduce packing.

METHOD

Participants and Setting

The participants had been admitted to intensive pediatric feeding disorders day-treatment programs in the Midwest (Cliff) and the Southeast (Dave and Ty). Participants were included in this study if (a) they demonstrated packing of solids and (b) parents reported and we observed that they readily accepted and consistently consumed at least one solid or liquid without packing. Cliff was a 4-year-old boy who had been diagnosed with inversion of Chromosome 20, developmental delays, a history of milk-soy protein intolerance, and gastroesophageal reflux disease (GERD). He had been admitted to the feeding program because of gastrostomy (G-) tube dependence. Cliff consumed a small amount of Stage 2 baby foods and drank small amounts of Carnation Instant Breakfast (CIB) from a bottle. Dave was a 10-year-old boy who had been diagnosed with autism. He had been admitted to the feeding program for food selectivity. He inconsistently consumed french fries, potato chips, bologna,

and Kool-Aid. Ty was a 24-month-old boy with a history of failure to thrive, GERD, delayed esophageal clearance, delayed gastric emptying, mild bronchopulmonary dysplasia, otitis media, and prematurity. He had been admitted to the feeding program for insufficient oral intake. Ty consumed small amounts of food by mouth, and the occupational therapist determined that his chewing and swallowing skills were within normal limits based on the limited sample of foods that she observed Ty eat during the evaluation. However, his oral intake was insufficient to meet his nutritional needs. All children participated in a comprehensive interdisciplinary evaluation prior to admission to the program that determined that they were not at risk for aspiration. None of the children had been diagnosed with dysphagia.

Observers sat in the session room (4 m by 4 m), approximately 1.5 m from the child. Materials included utensils (e.g., spoon, Nuk brush, cup), high chair, toys, food trays, gloves, a bib in which the bottom folded to form a receptacle, and timers.

Dependent Variables and Data Collection

Trained observers collected data on laptop computers using an event-recording procedure. The main dependent variable was *packing*, defined as any food or liquid larger than a pea (Cliff and Dave) or a grain of rice (Ty) in the mouth 30 s after the entire bite entered the mouth, not including when the bite entered the mouth following re-presentation. We based the size criterion that defined packing (i.e., pea or grain of rice) on the size of the bolus that the feeder presented to the child (see below). Packing was converted to a percentage after dividing the number of occurrences of packing by the number of bites that entered the child's mouth.

A second observer collected data simultaneously but independently for 18%, 25%, and 38% of sessions for Cliff, Dave, and Ty, respectively. Interobserver agreement was calculated by dividing the smaller frequency of packing by the larger frequency and converting

the obtained ratio to a percentage. Mean interobserver agreement for packing was 96% (range, 71% to 100%) for Cliff, 99% (range, 92% to 100%) for Dave, and 97% (range, 88% to 100%) for Ty.

Design

An ABAB design was used for Cliff and Dave in which A was baseline and B was presentation of the chaser. A multielement design was used for Ty to evaluate packing with and without the chaser.

General Procedure

The child's parents selected the target foods. The texture of target foods was pureed (table food blended until smooth) for Cliff and Ty and table food cut into small pieces (1.3 cm by 1.3 cm) for Dave. Even though the occupational therapist reported that Ty's chewing and swallowing skills were within normal limits during the initial evaluation, more extensive observations during the day-treatment admission suggested that he lacked the strength and stamina to consume sufficient quantities of table-textured foods to gain weight and grow. Therefore, we used pureed food for Ty. Target foods for Cliff were broccoli in cheese sauce, tuna, potatoes, and chicken. Target foods for Dave were peaches, pears, oranges, green beans, carrots, yams, potatoes, peanut butter sandwiches, and chicken vienna sausages. Target foods for Ty were peaches, pears, fruit cocktail, applesauce, chicken, tuna, yogurt, pudding, sweet peas, carrots, spinach, sweet potatoes, pancakes, waffles, mashed potatoes, and oatmeal.

Children participated in blocks of feeding sessions, which we will refer to as meals, five times a day. We conducted sessions for the current analyses with Dave and Ty in all five of the meals. We conducted sessions for the current analyses with Cliff in three of the meals; other meals targeted different feeding behaviors. For all participants, we timed the meals so that at least 1 hr elapsed between the

start of each meal (e.g., 9:00 a.m., 10:15 a.m., 12:00 p.m., 2:30 p.m., 4:00 p.m.). The first (breakfast), third (lunch), and fifth (dinner) meals of the day were 45 min in length. The second (morning snack) and fourth (evening snack) meals of the day were 30 min in length. We used this schedule to approximate a young child's typical meal schedule (three meals and two snacks) within the confines of our 8:30 a.m. to 5:00 p.m. day-treatment program. The therapist conducted one to eight sessions during each meal. The number of sessions in each meal depended on the length of the meal (30 or 45 min) and the child's behavior.

Each session consisted of five presentations of the target foods. The therapist randomly selected four of the child's target foods to present in each session and presented the foods in a random order within the session. Because each session consisted of five bite presentations, the therapist presented three of the foods once and one of the foods twice.

Baseline. Prior to implementation of the chaser, we developed individualized interventions to increase acceptance (the child opening his mouth in the absence of inappropriate behavior and negative vocalizations within the first 5 s of presentation) of the target foods. These individualized interventions for bite acceptance formed the baseline conditions of the chaser assessment described below. Although the intervention procedures for bite acceptance resulted in increased acceptance of target foods ($M > 80\%$ for all participants) and low levels of expulsion, all children packed the accepted target foods. However, parents reported and we observed anecdotally that all the children consistently consumed specific liquids or solids without packing (described below) that we used as chasers.

The baseline for the chaser procedure for Cliff was nonremoval of the spoon (NRS) plus re-presentation. During NRS, a level bolus was presented on a small maroon spoon approximately once every 30 s. The therapist formed the level bolus by filling the bowl of the spoon

and then scraping the bowl of the spoon on the side of the dish to level the bolus. The therapist held the spoon touching Cliff's lips for 5 s and deposited the bite into his mouth if he accepted it. If he did not accept the bite within 5 s, the therapist continued to hold the spoon touching his lips and deposited the bite when his mouth was open. Verbal praise was provided if he accepted the bite within 5 s. The therapist re-presented expelled bites by collecting the expelled bite on the spoon and placing it back into his mouth. The therapist prompted him to "show me" 30 s after the entire bite entered his mouth to determine if he had swallowed and to provide observers the opportunity to score a pack. If he did not open his mouth wide enough for the therapist and observers to detect the presence or absence of food, the therapist used a rubber-coated baby spoon to open his mouth by inserting the spoon into his mouth and turning it 90°. Verbal praise was provided for mouth clean. (*Mouth clean* was defined as no food larger than the size of a pea in his mouth at the 30-s check.) If Cliff was packing the bite, the therapist prompted him ("You need to swallow") and presented the next bite. The program's occupational or speech therapist had approved the procedure.

If Cliff had food larger than a pea in his mouth 30 s after the last (fifth) bite of the session entered his mouth, the therapist continued to prompt him to "swallow your bite" every 30 s. No other differential consequences were provided for inappropriate mealtime behavior and negative vocalizations. If Cliff vomited, the therapist wiped the vomit from his face and clothing quickly without providing vocal attention or changing his or her facial expression and continued the procedure. The session continued until he swallowed all of the presented bites or until 15 min had passed. If he had food or liquid in his mouth at the 15-min time cap, the therapist wiped out his mouth after the session ended.

The baseline for the chaser procedure for Dave was similar to Cliff's with the following

modifications. The therapist presented a spoon and one piece of food on a plate in front of Dave. If he failed to self-feed the bite within 5 s of its presentation (which never happened), the therapist would have placed the bite on a Nuk brush and placed slight pressure on his mandibular joint to open his mouth (physical guidance). The therapist would have then deposited the bite. Expelled bites were re-presented on the Nuk brush. The session continued until Dave swallowed all of the presented bites or until 120 min had elapsed. Sessions never reached the 120-min cap.

The baseline for the chaser procedure for Ty was similar to Cliff's, with the following exceptions. The therapist presented foods on a Nuk brush dipped in the food and interacted with Ty continuously throughout the session (e.g., talked, sang). Ty also had continuous access to preferred toys selected from a brief paired-choice assessment (Roane, Vollmer, Ringdahl, & Marcus, 1998) conducted prior to each session. There was no session cap because he swallowed the bites in a timely manner, and the session ended when Ty had swallowed all of the presented bites.

Chaser. The chaser was 4 ml of vanilla CIB for Cliff, a bite of pureed fruit for Dave, and 2 ml of PediaSure mixed with Benecalorie for Ty. We selected the chasers and chaser volumes based on parental report and our own observation that these were liquids or solids that the child accepted and consumed consistently without packing. The program speech therapist or occupational therapist recommended an immediate chaser for Cliff and Ty because she determined that they could not swallow consistently without the chaser, and recommended a delayed chaser for Dave to give him the opportunity to chew the bite before presentation of the chaser. Dave consistently chewed the bite before he swallowed.

The procedures during the chaser were identical to those of baseline, with the following modifications. The therapist presented the chaser once after each bite presentation for each

participant. That is, no additional chasers were presented following re-presentation. The therapist presented the chaser immediately after the bite entered Cliff's mouth by placing a pink cut-out (nosey) cup at his lips, instructing him to "take a drink," and depositing the liquid as soon as he opened his mouth, which he did consistently. The therapist checked Dave's mouth 15 s after the bite entered his mouth, using the general procedure described above to conduct the mouth check. If food larger than a pea was in his mouth, the therapist presented the chaser by placing a bite of pureed fruit on a spoon on a plate in front of him. If he did not take his bite of fruit within 5 s, which rarely occurred, the therapist deposited the bite of fruit onto his tongue with a Nuk brush by gently rolling the brush on his tongue without placing any pressure on his tongue. The therapist presented the chaser to Ty in a cup with a straw immediately after the bite entered his mouth and said, "Ty, take a drink." If he did not close his lips around the straw, the therapist said, "Ty, close your lips." The therapist said, "Good job closing your lips!" when Ty closed his lips around the straw independently or with a prompt. The therapist removed the drink after he took his drink or 5 s after lip closure, whichever came first. He always took the drink.

The therapist then followed the components of the child's solids treatment procedure for bite acceptance described above. The mouth-clean checks were based on when the target food entered the child's mouth rather than on when the chaser entered the child's mouth. No additional chasers were presented if the child was packing after the therapist presented the chaser for the fifth (final) bite of the session; only the verbal prompt to "swallow your bite" was provided, as described above.

RESULTS

Figure 1 shows the results of treatment for Cliff (top), Dave (middle), and Ty (bottom).

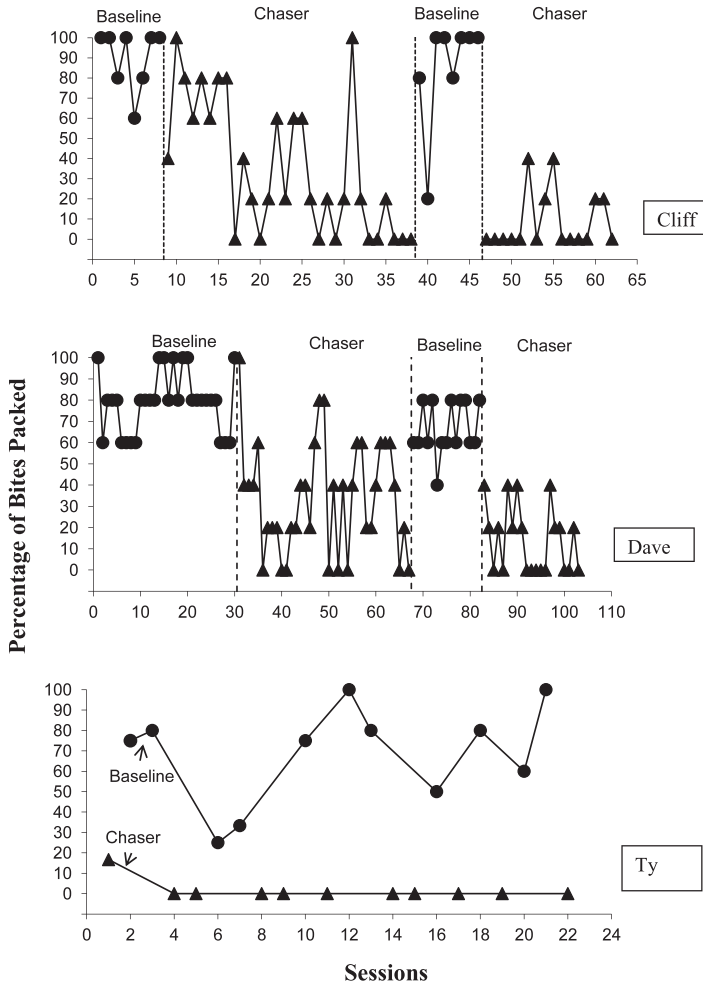


Figure 1. Percentage of bites packed for Cliff (top), Dave (middle), and Ty (bottom).

During baseline, the percentage of packs for Cliff was high ($M = 90\%$; range, 60% to 100%). When the chaser was implemented, packing gradually decreased, increased, and then leveled off to less than 20% ($M = 35\%$; range, 0% to 100%). Removal of the chaser resulted in an increase in the percentage of packs ($M = 85\%$; range, 20% to 100%). When the chaser was reintroduced, the percentage of packs decreased again ($M = 9\%$; range, 0% to 40%). Mean session length for Cliff was 6.5 min. The percentage of packs for Dave was high and variable during baseline ($M = 79\%$; range, 60% to 100%). With implementation of

the chaser, the percentage of packs decreased ($M = 34\%$; range, 0% to 100%). Packing increased to high levels when the chaser was discontinued ($M = 67\%$; range, 20% to 100%). When the chaser was reintroduced, levels of packing decreased, increased, and then decreased ($M = 14\%$; range, 0% to 40%). Mean session length for Dave was 8.5 min. The percentage of packs for Ty was high during baseline ($M = 69\%$; range, 25% to 100%). Packs decreased to stable low levels when the chaser was implemented ($M = 2\%$; range, 0% to 17%). Mean session length for Ty was 4.9 min.

DISCUSSION

These data add to the small but growing literature on the treatment of packing. Although the results of previous studies have shown that food blending (Mueller et al., 2004), texture manipulations (Patel et al., 2005), and redistribution (Gulotta et al., 2005; Volkert et al., 2011) are effective treatments, these procedures are not commonly used with typically eating children. The advantage of the chaser is that it is used by typically eating children to assist them in swallowing more difficult textures or consistencies of food (e.g., peanut butter sandwich and milk). Thus, a meal with a chaser as treatment might be more socially appropriate than a meal that included blending, texture manipulations, or redistribution. In addition, the chaser is a relatively noninvasive approach to treatment, and it is simple to implement. By contrast, procedures such as blending, texture manipulations, and redistribution may be more difficult or cumbersome for caregivers to implement. It might be informative to assess the social acceptability of the chaser with caregivers and compare its acceptability to other empirically validated treatments for packing. This was not the focus of the current study, but this could be a direction for future research.

The focus of the current study was to introduce and test a clinical treatment for packing, which is a common, yet understudied, problem observed in children with feeding disorders. In addition, this clinical treatment had not been tested previously. Clinical demonstrations such as the one conducted in the present study are important because they increase the available treatment options.

One limitation of the chaser is that it is only useful if the child consistently accepts and swallows a solid or liquid that can be used as a chaser. In the current study, the parents reported and we observed that all of the children consistently accepted and swallowed the solid or liquid that we used as a chaser. However, many children with feeding problems may not accept

and swallow any solids or liquids consistently; therefore, a chaser would not be a viable treatment. A related limitation is that even if the child consistently accepts and swallows a solid or liquid, some children may refuse to accept or swallow the chaser when used in treatment for packing. Although all of the children in the current study continued to accept and swallow the chaser over the course of the evaluation, future studies should examine the consistency with which children accept and swallow chasers when used as treatment for packing.

The focus of the current study was not to identify the operant mechanisms that are responsible for the effects of the chaser. However, we could speculate about the operant mechanisms in light of the current data and those of previous studies on packing. Gulotta et al. (2005) hypothesized that some children with feeding problems may have difficulty swallowing due to poor oral motor skills. Gulotta et al. suggested that redistribution, the procedure used in their study, compensates for poor oral-motor skills by approximating one of the early behaviors in the chain necessary for swallowing. The chain includes formation of the bolus, elevation and posterior movement of the tongue, and sequential contact of the tongue with the hard and soft palate to propel the bolus into the pharynx. During redistribution, the bolus is collected from the child's mouth and placed on the child's tongue, thereby eliminating the need for the child to form the bolus. Similarly, the chaser may have facilitated swallowing by augmenting bolus manipulation and propulsion.

A second possible reason for the efficacy of the chaser is that it may have reduced the response effort (Kerwin, Ahearn, Eicher, & Burd, 1995) associated with swallowing by reducing the texture of the packed food. That is, the mixture of the packed food and the chaser was a lower texture than that presented initially, more similar to baby food for Cliff and Ty and more similar to wet ground for Dave. Although pureed food is a relatively low texture, it does

have small pieces in it, which may present difficulties for some children. By contrast, baby food and liquids are completely smooth and less viscous, which may be easier to swallow. Patel, Piazza, Santana, and Volkert (2002) and Patel *et al.* (2005) showed that children with feeding problems may be more likely to swallow foods after reductions in texture. Reducing the texture of the packed food may have functioned as a motivating operation to reduce the aversive properties of eating (Patel *et al.*, 2005). For children with feeding problems, swallowing may become aversive if it is paired with choking, gagging, or vomiting (Gulotta *et al.*, 2005; Patel *et al.*, 2002; Shore, Babbitt, Williams, Coe, & Snyder, 1998), which often occurs when children have associated medical conditions such as GERD (e.g., Cliff and Ty) or limited experience eating. Therefore, these children may exhibit packing to avoid swallowing. Reducing the texture of presented food may reduce the aversive properties of swallowing, resulting in decreased packing.

An alternative explanation is that packing is maintained by automatic negative reinforcement in the form of avoidance of swallowing, and the chaser may function as escape extinction. For example, the chaser may disperse the packed food and propel it toward the back of the mouth where it contacts the anterior faucial arches. This contact triggers the swallow response. At this point, the child cannot avoid swallowing because once triggered, the swallow is a reflexive response that occurs automatically. Thus, the child is no longer able to avoid swallowing in the presence of the chaser. The repeated pairing of the chaser with the swallow response may extinguish the avoidance of swallowing. In the current study, the chaser appeared to be slightly less effective for Dave (who received the chaser 15 s after presentation of the target food if it was packed) than with Cliff or Ty (who received the chaser immediately after the target food). If packing was maintained by avoidance of swallowing, then delivering the chaser immediately after bite

presentation may be more effective than delayed delivery of the chaser, because delayed delivery would allow the child brief access to the reinforcer. Future studies should compare the effectiveness of an immediate and a delayed chaser.

It may be the case that a combination of the mechanisms described above contributed to the effectiveness of the chaser for the children in the current investigation or that different operant mechanisms are responsible for the efficacy of the chaser for different children. Future studies should investigate potential operant mechanisms that are involved in the behavioral phenomenon of packing and its treatment for individual children.

One cautionary note about chasers is warranted. Individuals at risk for aspiration may have more difficulty swallowing mixed textures (e.g., chicken noodle soup) safely. None of the participants in this study demonstrated any symptoms (i.e., coughing, choking) of aspiration, and none were at risk for aspiration according to their medical evaluation. However, it may not be advisable to use liquid chasers to decrease packing of solid foods in children at risk for aspiration or if the child's risk for aspiration is unknown. In addition, it is important to provide the child with the opportunity to chew the bite prior to presenting the chaser when the target food is table texture.

One limitation of the current investigation is that we did not determine whether the children learned to swallow without the chaser. It is possible that the chaser could be faded or eliminated. Future studies may want to include periodic no-chaser probes to determine if the child eventually begins to swallow in the absence of the chaser. An alternative would be to establish the efficacy of an immediate chaser and then insert delays before the chaser presentation to provide the child with the opportunity to swallow in the absence of the chaser. Fading also could involve decreasing the volume of the chaser gradually over time.

The present study adds to the growing literature on treatment of packing in pediatric

feeding disorders. We demonstrated that a simple, noninvasive procedure that included a chaser decreased packing. Future studies should explore the role of various properties of liquids and solids (e.g., bolus size, preference, flavor, temperature, color, texture, food type) that increase or decrease their effectiveness as chasers. This could be done by assessments that control for these properties of liquids and solids. Future research also should explore whether long-term use of the chaser improves bolus-manipulation skills and facilitates the acquisition of swallowing skills. Finally, the effectiveness of the chaser compared to procedures such as redistribution (Gulotta et al., 2005; Volkert et al., 2011), blending (Mueller et al., 2004), and texture manipulations (Patel et al., 2005) should be investigated.

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Received January 21, 2011

Final acceptance June 13, 2011

Action Editor, Rachel Thompson