

*DECREASING EXPULSIONS BY A CHILD WITH A FEEDING
DISORDER: USING A BRUSH TO PRESENT AND RE-PRESENT FOOD*

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Previous research has demonstrated that extinction in the form of re-presentation of expelled bites is an effective intervention for treating food expulsion. The current study compared the effectiveness of re-presenting expulsions with a spoon to re-presenting with a Nuk® brush for a 4-year-old boy with a feeding disorder. Fewer expulsions were observed when using the brush for re-presentation, and further reductions were observed when the brush was also used for initial presentations.

DESCRIPTORS: food re-presentation, expulsions, pediatric feeding disorders

Expulsion of food is a problematic behavior exhibited by children with feeding disorders. Frequent expulsions during meals are often associated with decreased food consumption and longer meal durations. Results of several studies (Ahearn, Kerwin, Eicher, Shantz, & Swearingin, 1996; Coe et al., 1997; Sevin, Gulotta, Sierp, Rosica, & Miller, 2002) have demonstrated that escape extinction (i.e., presenting and re-presenting food on a spoon until the food was consumed) is an effective intervention for decreasing expulsions.

In studies conducted by Gulotta, Piazza, Patel, and Layer (2005) and Patel, Piazza, Santana, and Volkert (2002), expulsions were re-presented with a Nuk® teething brush (i.e., a soft nubby brush designed to massage the gums and provide oral stimulation) instead of a spoon until the food was consumed. Patel et al. used a brush to re-present food throughout the analysis, but expulsions decreased only when the food type and texture were manipulated. Gulotta et al. used either a spoon or a brush to present and re-present expulsions. However, expulsion was not problematic for the children in their study; thus, the effectiveness of re-

presentation of expelled bites with a brush was not directly evaluated. The purpose of the current study was to extend the work of Gulotta et al. and Patel et al. by comparing the effectiveness of presenting and re-presenting food with a spoon versus a brush to decrease expulsions of a 4-year-old boy with a feeding disorder.

METHOD

Participants and Setting

John was a 4-year-old boy who had been admitted to an inpatient program for the assessment and treatment of a feeding disorder. At admission, John was 100% gastrostomy-(G-)tube dependent and had a limited oral feeding history prior to his G-tube placement. John reportedly licked small amounts of food, but never enough to decrease his tube feedings. His medical history included premature birth, gastroesophageal reflux, tracheomalacia, bronchopulmonary dysplasia, pneumonia, and a Nissen fundoplication. With a history of tracheomalacia, John was at risk for swallowing dysfunction, and it was recommended that he participate in a modified barium swallow (MBS) study to rule out potential aspiration. Because he exhibited frequent expulsions when food was placed in his mouth, the treatment of expulsions was imperative for his participation in the MBS study.

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Response Measurement and Reliability

The primary dependent variable was expulsion (defined as any food larger than the size of a pea, which had already been deposited in the mouth, visible outside the lips). Data were collected on laptop computers using an event-recording procedure. A trial began when an initial spoonful of food (i.e., one that had not been placed in the mouth) was presented at John's lips and ended after the food was swallowed (i.e., not visible in the mouth). Any subsequent presentations of food (following expulsion) within the same trial were referred to as re-presentations. Thus, an expulsion was recorded if John expelled food after the initial presentation and if he expelled following subsequent re-presentations. This combined measure (i.e., initial expulsions plus re-presented expulsions) was summed and divided by the number of trials conducted in each session to yield the average number of expulsions per trial for each session. Data were also collected on acceptance (i.e., opening mouth and allowing bolus placement behind the lips within 5 s of initial presentation) and disruption (i.e., turning the head at least 45° away from midline during food presentations; making contact with the spoon or the therapist's arm).

A second observer independently collected data on 34% of sessions. Exact agreement coefficients were calculated by comparing observer agreement on the exact number of responses for each 10-s interval in each session. Agreement coefficients were calculated by dividing the number of intervals with agreements by the total number of intervals and multiplying by 100%. The mean agreement coefficients were 93% (range, 82% to 100%) for expulsion, 95% (range, 92% to 100%) for acceptance, and 97% (range, 94% to 100%) for disruption.

Procedure

During all sessions, John was seated in a Rifton® chair. He had three meals per day (averaging 11 min per meal) consisting of one

to two sessions per meal (average session duration was 6 min) for a total of three to six sessions per day. Each session consisted of 12 trials. Three foods, chosen from a representative list of foods representing four food groups (i.e., fruit [peaches, pears], vegetable [green beans, carrots], starch [mashed potato, pasta], and protein [yogurt, chicken]) were presented in each session. The order of food presentation was randomly distributed across sessions, and no significant differences in expulsions were observed across food groups. Based on the recommendations of the speech and occupational therapist, all foods were presented at a pureed texture on a small spoon at a half-level bolus size. Because a larger bolus size provided a better assessment of swallowing for the eventual MBS, the bolus was increased to a level spoon after decreases in expulsions were observed (described below).

Prior to the current analysis, escape extinction in the form of nonremoval of the spoon (NRS; Ahearn *et al.*, 1996; Sevin *et al.*, 2002) was implemented to increase John's acceptance and decrease disruptions during meals. During the prior NRS procedure, expelled foods were collected and removed and followed by a new presentation of food (i.e., there were no re-presentations of expelled foods). Subsequent to the NRS procedure, acceptance was nearly 100% and disruptions were near zero. However, John continued to exhibit expulsions after acceptance. When the NRS contingency was removed, acceptance did not return to baseline levels, indicating that NRS was no longer necessary.

Based on the results of the prior analysis, throughout the current analysis escape was provided for disruptions of presentations and re-presentations of foods (i.e., contingent on a disruption, the spoon or brush was removed). The escape contingency was also applied to nonacceptance. That is, if John did not open his mouth within 5 s of an initial presentation or a re-presentation and did not engage in

disruptive behavior, the spoon or brush remained at his mouth for 30 s until he opened his mouth. If he did not open his mouth after 30 s, the spoon or brush was removed and the next food was presented.

To assess the relative effects of presenting and re-presenting expulsions with either a spoon or a brush, a reversal (ABABCBC) design was used. In each condition, expelled food was collected and re-presented following each expulsion until no further expulsions were observed. In the presentation and re-presentation with spoon condition (P-spoon/RP-spoon), initial presentations were presented at John's lips with a spoon and placed on his tongue until his lips closed around the spoon. The spoon was then slowly removed. Expulsions were collected on the spoon and re-presented with the same procedure. The presentation with spoon and re-presentation with brush condition (P-spoon/RP-brush) was identical to the previous condition except that expulsions were collected on the brush and then placed on the middle of John's tongue. When placing the expulsion in the mouth, the therapist rotated the brush clockwise on the tongue while slowly pulling the brush out of the mouth, which resulted in the food being deposited in the middle of the tongue. During the presentation with brush/re-presentation with brush condition (P-brush/RP-brush), the procedures were identical to the previous phase except that the brush was used for both initial presentations and re-presentations. For the initial presentation, the bolus size was measured on the spoon and transferred onto the brush by sliding the food off the spoon and onto the brush.

RESULTS AND DISCUSSION

Results are presented in Figure 1. John's expulsions averaged 3.7 responses per trial (range, 3.3 to 4.2) during the initial P-spoon/RP-spoon phase and 1.3 per trial (range, 0.9 to 1.8) during the subsequent P-spoon/RP-brush

condition. During the reversal to the P-spoon/RP-spoon condition, expulsions increased ($M = 4.6$; range, 4.4 to 4.7) and then decreased ($M = 1.1$; range, 1.0 to 1.2) when the P-spoon/RP-brush condition was reimplemented. When the brush was used to present and re-present food (P-brush/RP-brush), expulsions decreased further ($M = 0.4$; range, 0.2 to 0.5). After the bolus size was increased to a level spoon, expulsions increased initially, but then decreased ($M = 0.3$; range, 0.1 to 0.7) and remained stable. When P-spoon/RP-brush was implemented with the level bolus size, expulsions increased ($M = 0.9$). During the final phase of the analysis, the P-brush/RP-brush condition was reimplemented with a level bolus and expulsions decreased ($M = 0.3$; range, 0.04 to 0.6). Throughout the analysis, John's average percentage of acceptance was very high ($M = 98\%$) and his disruptions per trial were near zero ($M = 0.04$) across all conditions, even though the escape contingency was in effect (data not shown).

Subsequent to this study, John successfully participated in the MBS study (without demonstrating aspiration), accepting all of his bites with minimal expelling. At discharge, his expulsions remained low and he was accepting initial presentations on the spoon (suggestive of increased skill improvement over time) with expulsions re-presented on the brush. He was consuming enough solid food to discontinue his G-tube feedings.

The results of the current study demonstrated that presenting and re-presenting food with a brush was more effective in decreasing expulsions than presenting or re-presenting food with a spoon or re-presenting only expulsions with a brush. Despite this outcome, the operant mechanism underlying this effect is unknown. Previous research (Ahearn et al., 1996; Coe et al., 1997; Sevin et al., 2002) has suggested that re-presentation of expelled foods may function as escape extinction for expulsions. Although the function of expulsion was

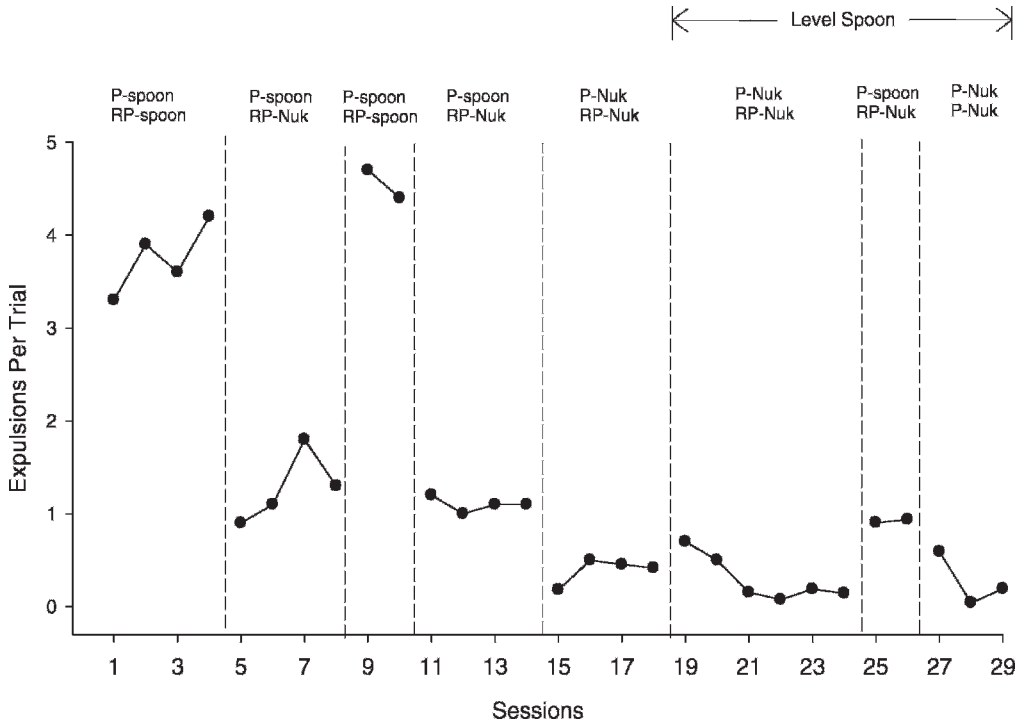


Figure 1. Mean expulsions per trial.

not evaluated in this study, all re-presentation procedures prevented escape from eating by re-presenting expulsions until the food was consumed. Thus, in the current study it is not likely that expulsion was maintained by negative reinforcement alone because expulsions persisted even when the re-presentation contingency was in effect.

It is also possible that the decrease of expulsions was due to an attempt to avoid the brush (i.e., negative reinforcement). This may explain why P-brush/RP-brush was more successful than P-spoon/RP-brush. If decreased expulsion was due to avoidance, the obtained results may be attributed to more exposure to the aversive event in the P-brush/RP-brush condition. By contrast, it is possible that the direct placement of the bolus on the middle of the tongue may have made it more difficult to maneuver the bite and propel it out. Thus, it is possible that expulsion decreased as a result of

increased response effort to expel. Likewise, using the brush to place the bolus on John's tongue may have helped compensate for some oral motor-skill deficits. Results of an interdisciplinary assessment of John's oral motor skills suggested that with his medical and developmental history and limited exposure to food, he may have had difficulty managing the bolus; as a result, he was unable to keep the food in his mouth. Therefore, placement directly onto his tongue may have decreased the response effort needed to swallow the food (i.e., less effort was needed to propel the food back; Gulotta *et al.*, 2005).

Future studies should evaluate different procedural variations to better understand the operant mechanism responsible for the effects observed in the current investigation. An examination of other methods or locations of food placement (e.g., flipped spoon procedure, side or cheek deposit) may help determine the

impact of bolus placement and the stimulus properties of the brush (e.g., nubby texture) on the results. Presenting and re-presenting food by flipping the spoon onto the middle of the tongue would permit control of bolus placement while evaluating the potentially aversive stimulus properties of both utensils. A bolus placement into the side of the mouth or cheek might also provide information on the role of tongue placement on expulsions.

Due to the inclusion of only 1 participant, the generality of the current results is unknown; future research should attempt to replicate these findings. Also, despite its effectiveness in decreasing expulsions, for some caregivers presentations or re-presentations with a brush may be less socially acceptable than spoon presentations. Research should be conducted on the length of time such procedures are needed before upright spoon presentations can be reintroduced.

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