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An evaluation of a high-probability instructional sequence to increase acceptance of food and decrease inappropriate behavior in children with pediatric feeding disorders

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Abstract

We evaluated the effects of escape extinction with and without a high-probability (high-p) instructional sequence on food acceptance and inappropriate behavior for children diagnosed with feeding problems. The high-p sequence consisted of three presentations of a response that was similar topographically (i.e., presentations of an empty nuk®, liquid on a spoon, and a preferred liquid on a spoon) to the low-p response (i.e., presentation of a nuk with food, liquid from a cup, and presentation of a nonpreferred food). Acceptance of food increased in the presence and not the absence of the high-p sequence during initial withdrawals for two of the three children. In addition, the high-p sequence plus escape extinction was associated with reduced levels of inappropriate behavior relative to escape extinction alone for two children. Data are discussed in relation to behavioral momentum, motivating operations, and the relative contributions of the high-p instructional sequence and escape extinction in the treatment of feeding problems.

Keywords: Behavioral momentum; Motivating operations; Food refusal; High-p instructional sequence; Pediatric feeding disorders

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Food refusal is a common problem in children with developmental disabilities (Palmer & Horn, 1978), which may be exhibited in a variety of ways. For example, a child may engage in head turning, batting at the spoon, crying, or tantruming to avoid eating. Other refusal behaviors may include clenching the teeth or refusing to open the mouth. Regardless of the specific topographies of inappropriate mealtime behavior exhibited by the child, a common aspect of food refusal is the child's noncompliance with either explicit (e.g., "eat your peas") or implicit (e.g., presentation of the spoon to the mouth) instructions to eat.

One method that has been used to treat noncompliant behavior is the high-probability (high-p) instructional sequence. In the high-p instructional sequence, an instruction with a low probability of compliance (low-p instruction) is preceded by instructions with a high probability of compliance (high-p instructions). For example, Mace et al. (1988) used the high-p sequence with four adults with mental retardation to increase compliance for low-p instructions. Subsequently, Zarcone, Iwata, Mazaleski, and Smith (1994) evaluated the effects of the high-p sequence on the compliance and self-injurious escape behavior (SIB) of two participants. The high-p sequence failed to increase compliance or decrease SIB when SIB continued to produce escape. When the high-p sequence was implemented in conjunction with escape extinction, SIB decreased for both participants.

Even though studies on the high-p sequence may have relevance to the treatment of feeding problems, few studies have evaluated the effectiveness of the high-p sequence with children with feeding disorders. And, unlike most of the literature on the high-p sequence in the treatment of noncompliance (e.g., Ducharme & Worling, 1994; Mace & Belfiore, 1990; Mace et al., 1988), the studies on feeding disorders have demonstrated either negative (Dawson et al., 2003) or transient (McComas et al., 2000) effects. Dawson et al. (2003) evaluated the effectiveness of the high-p sequence with and without escape extinction with one child diagnosed with a feeding disorder. Acceptance of food did not increase when the high-p sequence was implemented while refusal behaviors (e.g., head turning, batting at the spoon) produced escape. By contrast, acceptance increased when escape extinction was implemented independent of the presence or absence of the high-p sequence. The results of Dawson et al. (2003) were similar to Zarcone et al. (1994) in that the high-p sequence failed to compete with an ongoing reinforcement contingency for escape behaviors.

Similarly, McComas et al. (2000) compared a multicomponent treatment, which included escape extinction with and without the high-p sequence for one participant diagnosed with a feeding disorder. Compliance with the low-p request (acceptance of a bite of food) increased more rapidly when the high-p procedure was present (i.e., acceptance increased in the second session). However, levels of acceptance also increased in the absence of the high-p procedure after five sessions.

In sum, prior research has demonstrated largely positive effects with high-p sequences in the treatment of other forms of noncompliant behavior. However, limited research exists on the effects of high-p sequences with feeding problems. Moreover, this research suggests that high-p sequences either (a) do not contribute to the treatment of feeding problems (with or without escape extinction; Dawson et al., 2003), or (b) may result in small, transient effects during feeding treatments with escape extinction (McComas et al., 2000).

Thus, the purpose of the current investigation was to further investigate the effects of high-p sequences during the treatment of feeding problems. Specifically, we evaluated the relative contribution of escape extinction with and without the high-p sequence on levels of

acceptance (low-p response) and inappropriate behavior for two children. In addition, for one participant, we also evaluated the effects of the high-p sequence in the absence of escape extinction.

1. Method

1.1. Participants and setting

Three children diagnosed with a feeding disorder participated. All three children were included in this study because they were accepting little, if any, food at the time of admission, and other treatments (e.g., escape extinction alone) were not effective for increasing acceptance. In addition, we observed that the children would comply with other topographically similar requests (e.g., acceptance of an empty spoon).

Nick was a 6-year-old male diagnosed with developmental delays. His medical history included congenital blindness, laryngomalacia, gastrostomy (G) tube dependence, gastroesophageal reflux (GER), and failure to thrive (FTT). Nick was not taking any medication for his GER because it was not medically indicated at the time of admission or during this study. Upon admission, Nick was receiving 100% of his needs via G-tube feedings, and he refused all foods. Nick used a few signs consistently and was able to follow one- to two-step instructions. Kisha was a 2-year-old female diagnosed with developmental delays. Her medical history included intraventricular hemorrhage (III), FTT, GER, and bottle dependence. At the time of the study, Kisha was taking Prilosec® twice a day for GER. Upon admission, Kisha was consuming small amounts of solids from a spoon and receiving most of her calories through a bottle. Kisha used a few words consistently and followed a few simple instructions. Simone was a 2-year-old female diagnosed with mild developmental delays. Her medical history included bronchiopulmonary dysplasia, GER, and G-tube dependence. At the time of the study, Simone was taking Zantac® and Reglan® for GER. Upon admission, Simone was receiving 100% of her needs via G-tube feedings. Simone spoke in two- to three-word phrases and was able to follow one- to two-step instructions.

Sessions were conducted in a 3 m × 2.5 m room with a one-way mirror. All rooms were equipped with a table, booster seat (Nick) or high chair (Kisha and Simone), and feeding utensils. Approximately, three to five session blocks were conducted each day consisting of three to four treatment sessions within each block (for a total of 9–20 sessions per day). The contingencies for the session were explained to the participant prior to each session. For Nick, all sessions were 5 min in duration, unless escape extinction was being implemented at the 5-min mark. If so, the session was terminated when the last bite was accepted or 1 h, whichever came first. For Kisha and Simone, sessions consisted of five low-p presentations during low-p (only) sessions or 1 h, whichever came first. During the high-p treatment for Kisha and Simone, the total number of presentations was 20 (five low-p and 15 high-p).

Nick's mother conducted all sessions during his treatment evaluation. Nick's mother was trained prior to the study and implemented the procedures with 90% accuracy during low- and high-p sessions. A trained therapist conducted all sessions for Kisha and Simone. Nick and Simone were presented with stage 1 and 2 baby foods per the advice of the

occupational therapist and Kisha was presented with Carnation Instant Breakfast® (CIB) and whole milk per the advice of the nutritionist.

1.2. Dependent variables and data collection

The dependent variables were acceptance of solids (the entire bite of food entering the child's mouth within 5 s of the presentation), acceptance of liquids (the initial entrance of liquid in the mouth within 10 s of the presentation), and compliance for the high-p requests. The high-p request was presentation of the empty nuk for Nick, liquid on the spoon for Kisha, and preferred liquid on a spoon for Simone. Compliance was scored if the empty nuk (Nick), liquid on the spoon (Kisha), or preferred liquid on a spoon (Simone) was deposited in the mouth within 5–10 s of the presentation. Inappropriate behavior was recorded for Kisha and Simone. Inappropriate behavior included head turning (turning the head greater than 45° from the presentation of the spoon or cup) and batting or blocking (contact of the hand with the spoon/cup or covering the mouth with the arm or hand). Data on acceptance, compliance, and inappropriate behavior were collected on laptop computers using an event recording procedure.

Percentage of trials with acceptance was calculated by dividing the occurrence of acceptance by the number of presentations (bites/drinks placed in front of the child) multiplied by 100%. Compliance was converted to a percentage by dividing the frequency of acceptance of the high-p response divided by the number of high-p presentations multiplied by 100%. Data on inappropriate behavior were converted to responses per min (rpm) by dividing the number of inappropriate behaviors by the duration of the session in minutes.

A second observer independently scored 13 and 36% of the compliance assessment sessions for Nick and Simone, respectively. Interobserver agreement for Nick and Simone during the compliance assessment was calculated by dividing the smaller frequency of the behavior during the session by the larger frequency multiplied by 100%. The mean total interobserver agreement was 88% (range, 73–97%) for compliance for Nick, and 96% (range, 82–100%) for compliance and 95% (range, 87–100%) for inappropriate behavior for Simone.

A second observer independently scored 40, 29, and 38% of the sessions during the evaluation of the high-p treatment for Nick, Kisha, and Simone, respectively. IOA was recorded and calculated as described above. The mean total interobserver agreement was 85% (range, 77–93%) for compliance and 88% (range, 70–100%) for acceptance for Nick; 99% (range, 95–100%) for compliance, 99% (range, 91–100%) for acceptance, and 97% (range, 91–100%) for inappropriate behavior for Kisha; and 97% (range, 86–100%) for compliance, 92% (range, 77–100%) for acceptance, and 98% (range, 91–100%) for inappropriate behavior for Simone.

1.3. Experimental design

A reversal design was used with Nick (ABAB) and Kisha (BABAB) to evaluate the effects of the high-p sequence on acceptance and inappropriate behavior (Kisha). In the A phase, low-p instructions were presented alone, and in the B phase high-p instructions preceded low-p instructions. A reversal design (ABAB) was used to evaluate the effects of escape extinction on acceptance and inappropriate behavior for Simone. In addition, a

multielement design was used to evaluate the relative effects of escape extinction with and without the high-p sequence. In the A phase, high-p instructions preceded low-p instructions. In the B phase, escape extinction was implemented across two conditions (high-p + escape extinction and escape extinction alone).

1.4. Procedures

1.4.1. Nick

Prior to the current assessment, a treatment consisting of escape extinction was implemented. Acceptance increased relative to baseline following the implementation of escape extinction; however, the increases were not acceptable clinically. Therefore, we added the high-p sequence to escape extinction to determine if the addition of the high-p sequence would enhance the effects of escape extinction further.

1.4.1.1. General procedures. A nuk massaging brush was used for Nick during all sessions. We used the nuk because Nick had severe oral motor deficits (i.e., no lip closure, a humped tongue during presentation, and tongue thrust). The nuk was placed on Nick's top lip with the verbal prompt to ''take a bite''. Sequential verbal (''Nick, open''), partial physical (tapping on the chin and saying, ''Nick, you need to open like this''), and physical (index finger and thumb were placed on Nick's upper and lower lips) prompts were used to prompt Nick to open his mouth. If Nick did not respond within 5 s of a prompt, the next prompt in the hierarchy was initiated. The nuk only was deposited if his mouth was open wide (i.e., 2.54 cm) and his tongue was flat. The purpose of this procedure was to teach Nick to open his mouth wide enough for the nuk to be deposited on a flat tongue. If the nuk entered his mouth within 5 s of the verbal prompt, a pre-recorded tape of many individuals delivering praise was played along with praise from his mother. If the nuk did not enter his mouth within 5 s of the verbal prompt, no praise was delivered. The prompting procedure continued until the nuk was deposited into the mouth or until 5 min elapsed (nonremoval of the nuk). Nuk presentations occurred within 5–10 s of the bite being deposited (i.e., once the nuk entered the mouth, Nick's mother waited between 5 and 10 s before the next presentation). Inappropriate behavior was ignored.

1.4.1.2. Compliance assessment. Ten compliance assessment sessions were conducted to demonstrate that acceptance of the empty nuk was a high-p response. During each session, an empty nuk was presented to Nick using the nuk presentation procedure described above (i.e., nonremoval of the nuk, sequential prompting, verbal praise). These sessions were initiated prior to the high-p treatment evaluation.

1.4.1.3. Low-p sequence only. A nuk with food (approximately 2.5 ml) was presented to Nick using the procedures described above. Expelled bites were ignored because a previous evaluation showed that re-presentation was ineffective for reducing expulsion, which did occur periodically.

1.4.1.4. High-p sequence. All procedures were identical to the low-p sequence with the exception that three rapid empty nuk presentations (every 1–3 s) preceded the presentation

of food on the nuk and compliance with the high-p instruction resulted in brief praise. Although Nick may not have been able to discriminate visually between the high-p and low-p presentations due to his blindness, the presentation sequence remained the same (i.e., three high-p followed by one low-p presentation); thus discriminative cues relative to the presence or absence of food were available to him via the invariant presentation sequence and the olfactory cues associated with the presence of the food on the nuk.

1.4.1.5. Follow-up. Following the evaluation of the high-p sequence, Nick's mother continued to implement the procedure during mealtime in the clinic and subsequently at home following discharge. We also increased Nick's intake by increasing the length of meals and amount of food presented (i.e., from 5 min to volume-based) and decreased his tube feedings. We gradually faded out the use of the empty nuk for Nick during follow-up. By the 1-month follow-up, we presented the empty nuk once followed by a flipped spoon (with the goal of fading eventually to an upright spoon). By month 3, we had increased the texture from baby food to table puree (table food blended to a smooth consistency). During the 6-month follow-up visit, a flipped spoon with food was followed by an empty upright spoon to facilitate a swallow response as recommended by the occupational therapist.

1.4.2. Kisha

Similar to Nick, a treatment consisting of escape extinction was implemented with Kisha prior to the current assessment. Acceptance increased relative to baseline following the implementation of escape extinction; however, the increases were not acceptable clinically and inappropriate behavior remained at high levels. Therefore, we added the high-p sequence to escape extinction to determine if the addition of the high-p sequence would result in increased acceptance and decreased inappropriate behavior relative to escape extinction alone. A compliance assessment was not conducted with Kisha. However, previous treatment evaluations indicated that she readily accepted liquid on a spoon.

1.4.2.1. Low-p sequence only. CIB (7.5 ml) was presented to Kisha in a cup. During the first session of the meal block, Kisha fed herself (self-feeder) and during subsequent sessions of the meal block, the therapist fed her (nonself-feeder). We implemented this alternation between self-feeder and nonself-feeder protocols to give Kisha the opportunity to practice feeding herself per parental request.

Drinks were presented approximately every 30 s. The cup was presented on the high chair tray during the self-feeder protocol and the therapist presented a verbal prompt (i.e., ''Take a drink''). If Kisha did not take a drink within 5 s of the verbal prompt, a partial physical prompt was initiated (i.e., therapist tapped Kisha's hands toward the cup). If Kisha did not take the drink within 5 s of the partial physical prompt, a physical prompt was initiated (i.e., therapist held her hands to the cup and applied gentle pressure to the mandibular joint; physical guidance, Ahearn, Kerwin, Eicher, Shantz & Swearingin, 1996). The physical prompt was implemented until the drink was deposited in Kisha's mouth. Verbal praise and light physical touch (e.g., high fives, pat on the back) were delivered if Kisha accepted her drink after the verbal or partial physical prompt.

During the nonself feeder protocol, the therapist held the cup to Kisha's mouth. If the drink did not enter her mouth within 5 s of the presentation, a physical guidance procedure was implemented until the entire drink was consumed. Verbal praise was delivered if the drink entered Kisha's mouth within 5 s of the presentation. All inappropriate behavior was ignored or blocked. Expelled bites were re-presented (i.e., placed back into the mouth) until the entire bolus was consumed.

1.4.2.2. High-p sequence. Procedures during the high-p sessions were identical to the low-p sessions with the exception that three rapid spoon presentations (every 1–3 s) of the CIB preceded the presentation of the cup and compliance with the high-p instruction resulted in brief praise. The therapist presented all spoon presentations to Kisha.

1.4.3. Simone

The high-p procedure was overlaid on a pre-existing escape extinction procedure for Nick and Kisha. The results for Nick and Kisha suggested that the high-p sequence plus escape extinction was more effective than escape extinction alone with respect to increases in acceptance (Nick and Kisha) and decreases in inappropriate behavior (Kisha). However, it was not clear whether the high-p sequence alone would have been effective in the absence of escape extinction for either participant. Therefore, in our final case (Simone), we first tested the effects of the high-p procedure in the absence of escape extinction, and then added escape extinction when the high-p procedure alone did not result in increased acceptance or decreased inappropriate behavior.

1.4.3.1. Compliance assessment. Compliance assessment sessions were conducted to demonstrate that acceptance of a spoon of water was a high-p response. In addition, we compared acceptance of water on a spoon with acceptance of food on a spoon, when inappropriate behavior produced escape from the presentation. The spoon was placed at Simone's lips and the therapist delivered a verbal prompt (i.e., ''Take a bite''). If she engaged in inappropriate behavior the spoon was removed for 20 s. The next spoon presentation occurred immediately after the escape period. If Simone did not engage in inappropriate behavior, the spoon remained at her lips for the remainder of the 30-s interval at which time the next spoon presentation was initiated. Verbal praise and light physical touch (e.g., high fives, pat on the back) were delivered if bites entered her mouth within 5 s of the presentation. Expelled bites were ignored.

1.4.3.2. High-p sequence with escape (High-p + ESC BL). The entire presentation sequence (i.e., high-p presentations followed by low-p presentations) occurred approximately every 30 s. Three rapid presentations (every 1–3 s) of water on a spoon (high-p presentation) preceded the presentation of food on a spoon (low-p presentation). The high-p bite remained at Simone's lips until the bite entered her mouth. Compliance with the high-p instruction resulted in brief praise. Expelled bites of water were re-presented. The low-p bite was placed at Simone's lips and the therapist delivered a verbal prompt (i.e., ''Take a bite''). If she engaged in inappropriate behavior following the bite of food, the spoon was removed for 20 s. The next high- plus low-p bite sequence was presented immediately after the escape period. If Simone did not engage in inappropriate

behavior following the low-p presentation, the spoon remained at her lips for the remainder of the 30-s interval at which time the next high- plus low-p sequence was initiated. Verbal praise and light physical touch (e.g., high fives, pat on the back) were delivered if low-p bites entered the mouth within 5 s of the presentation. Expelled bites of food were ignored.

1.4.3.3. Escape extinction (EE) versus high-p sequence plus escape extinction (High-P + EE). Procedures during high-p + EE sessions were identical to high-p with escape sessions except that Simone was not allowed to escape low-p instructions. If inappropriate behavior occurred, the spoon remained at Simone's lips until the bite entered her mouth (nonremoval of the spoon). Expelled bites were represented. All inappropriate behavior was ignored or blocked. Escape extinction alone sessions were identical to the high-p + EE sessions; however only the low-p instruction was presented.

2. Results

Compliance with the empty nuk was high during the compliance assessment ($M = 89\%$; data not shown) for Nick. Fig. 1 (top panel) depicts acceptance for Nick during the treatment evaluation. Escape extinction was in place across phases. Acceptance (low-p only) was low when low-p instructions (nuk with food) were presented alone ($M = 45.94\%$) and increased once the high-p (empty nuk) preceded the low-p instructions ($M = 97.78\%$). This pattern was repeated during the withdrawal. Compliance remained above 90% for the high-p response during the treatment evaluation (data not shown). Moreover, acceptance for the low-p response remained high during 1-, 3-, and 6-month follow-up.

Fig. 1 (middle panel) depicts acceptance (low-p only) for Kisha during the treatment evaluation. Escape extinction was in place across phases. Acceptance was high ($M = 83.33\%$) when the high-p sequence (CIB on a spoon) preceded the low-p sequence (CIB in a cup) and decreased when the low-p sequence was presented alone ($M = 42.0\%$). Similar patterns consistently occurred during subsequent withdrawal phases. Compliance was 98% for the high-p response during the treatment evaluation (data not shown). Fig. 1 (bottom panel) depicts inappropriate behavior per min for Kisha during the treatment evaluation. Inappropriate behavior was lower ($M = 2.59$ rpm) when the high-p sequence was initiated and increased during the low-p phase ($M = 9.19$ rpm). This pattern of responding was then replicated.

Results from Simone's compliance assessment (data not shown) demonstrated that acceptance of water (high-p) was above 80%, while acceptance of food (low-p) was near zero. In addition, inappropriate behavior was higher during presentation of food (low-p) relative to inappropriate behavior during presentation of water (high-p). Fig. 2 (top panel) depicts acceptance (low-p only) for Simone during the treatment evaluation. Acceptance was low when the high-p sequence preceded the low-p instructions and inappropriate behavior during low-p instructions resulted in escape. When escape extinction was implemented during low-p instructions, acceptance increased to high levels independent of whether the high-p sequence was present ($M = 100\%$) or absent ($M = 96.47\%$). Inappropriate behavior (Fig. 2, bottom panel) was high when the high-p sequence preceded the low-p instructions and inappropriate behavior during low-p instructions

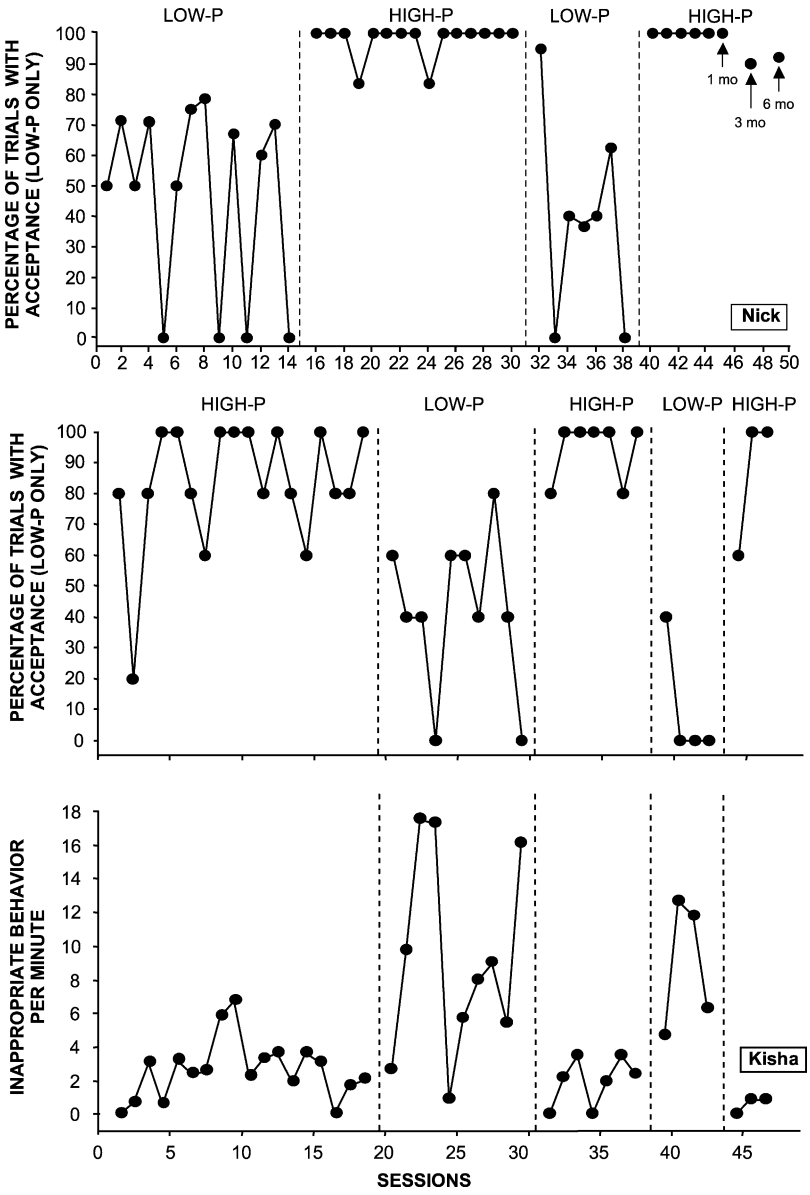

Fig. 1. Percentage of trials with acceptance for Nick (top panel), and percentage of trials with acceptance (middle panel) and inappropriate behavior per minute (bottom panel) for Kisha.

resulted in escape ($M = 4.47$ rpm). When escape extinction was implemented, inappropriate behavior decreased to near 0 in the high-p + EE condition ($M = 0.21$ rpm), but was higher and more variable ($M = 3.79$ rpm) when EE was implemented alone (i.e., low-p sequence only). This general pattern was then replicated.

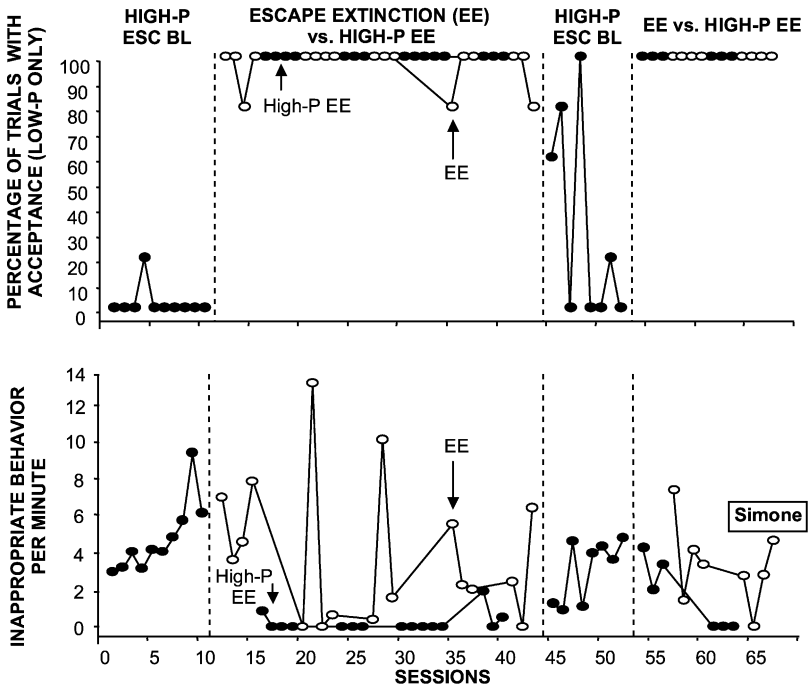

Fig. 2. Percentage of trials with acceptance (top panel) and inappropriate behavior per minute (bottom panel) for Simone during the evaluation of the high-p procedure and escape extinction.

3. Discussion

These data extend the literature on the high-p sequence and the treatment of feeding problems in several ways. First, the high-p sequence produced consistent increases in acceptance of food for two of the three children. The results of the withdrawals showed that acceptance increased to high levels when the high-p sequence was present and not when it was absent. By contrast, previous research on the high-p sequence in the treatment of feeding problems has produced either no (Dawson et al., 2003) or only transient (McComas et al., 2000) increases in acceptance. One possible explanation for these findings for the high-p sequence in the treatment of feeding problems may be related to the similarity between test and training stimuli.

The results of basic studies on behavioral momentum suggest that decrements in responding increase as a result of the dissimilarity between test and training stimuli (Nevin, 1974). Enhancing the similarity of the test and training stimuli should enhance the extent to which the high-p response functions as a discriminative stimulus to signal the availability of reinforcement and should produce smaller decrements in responding during extinction. Dawson et al. (2003) used simple fine motor responses (e.g., touch ear), which were not related or similar to the low-p response (eating). Thus, this discrepancy between high- and low-p responses may have contributed to the failure of the high-p procedure to produce

differential increases in acceptance. In the current investigation, the high-p instruction (i.e., ''take a bite'') was identical to the low-p instruction. Essentially, the only stimulus change from high-p to low-p was the addition of food or the use of a different feeding utensil (e.g., cup). The compliance response during both the high-p and low-p instruction was identical (opening of the mouth). Therefore, these similarities may have increased the probability that the momentum of compliance would persist from the high-p to the low-p instruction.

An alternative explanation of these findings is that the presentation of the high-p request acts as a motivating (establishing) operation and alters the momentary effectiveness of reinforcement (Michael, 1982; Smith & Iwata, 1997). It is possible that the high-p procedure alters the effectiveness of negative reinforcement, positive reinforcement, or both. With respect to negative reinforcement, Piazza et al. (2003) conducted functional analyses of the inappropriate mealtime behavior of 15 children with feeding problems and showed that the inappropriate behavior of the majority of children was maintained at least in part by negative reinforcement in the form of escape.

Other studies on escape-maintained behavior have demonstrated that altering some property of the demand context may reduce inappropriate behavior and increase compliance (e.g., Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Pace, Iwata, Cowdery, Andree, & McIntyre, 1993; Smith, Iwata, Goh, & Shore, 1995; Weeks & Gaylord-Ross, 1981). Smith and Iwata (1997) proposed that these investigations potentially demonstrate that the escape establishing functions of those tasks may be altered directly through manipulations of the characteristics of the tasks. For example, Smith et al. (1995) demonstrated that altering characteristics of demands such as task novelty, duration of instructional sessions, and rate of task presentations was associated with changes in levels of self-injurious behavior for some participants.

In the current investigation, we hypothesized that food on a nuk for Nick, liquid in a cup for Kisha, and food on a spoon for Simone functioned as aversive stimuli. Therefore, we potentially altered the characteristics of meals (demands) containing these aversive stimuli by also presenting an empty nuk to Nick, liquid on a spoon to Kisha, and water on a spoon to Simone. Altering these mealtime characteristics may have reduced motivation to escape. In short, the aversiveness of the meal may have been reduced, thereby establishing a new behavior in the participant's repertoire (acceptance of the nuk/spoon/cup) in the presence of a stimulus that previously evoked escape responses (Smith & Iwata, 1997).

The results for Simone's assessment provide partial support for this interpretation. First, we conducted an assessment in which food or water was presented on a spoon and escape was available for inappropriate behavior (Smith et al., 1995). Levels of inappropriate behavior were higher when food on a spoon was presented relative to water on a spoon when escape was available for inappropriate behavior. Thus, food and water on a spoon appeared to function as motivating operations (Michael, 1982; see also Laraway, Snycerki, Michael, & Poling, 2003). That is, food on a spoon appeared to increase (establishing operation) and water on a spoon appeared to decrease (abolishing operation) the effectiveness of escape as reinforcement. We propose this hypothesis conservatively as we did not conduct a pre-treatment functional analysis to establish conclusively that escape functioned as negative reinforcement for inappropriate behavior. Nevertheless, the

fact that levels of inappropriate behavior and acceptance varied as a function of the presence of food or water on the spoon even though escape was available for inappropriate behavior across both conditions is consistent with the effects of a motivating operation on behavior.

The data from Simone's treatment analysis, however, suggested that the high-p procedure alone (in the absence of escape extinction) did not result in increased levels of acceptance or decreased inappropriate behavior when escape was available. Nevin (1996) proposed that low levels of compliance might be a result of an extensive reinforcement history of escape from demands. Therefore, it may be difficult for the reinforcement contingencies available for compliance to compete with the extensive history of negative reinforcement (Dawson et al., 2003; Zarcone et al., 1994). Dawson et al. (2003) showed that acceptance increased when escape extinction was implemented independent of the presence or absence of the high-p sequence. Simone's analysis produced similar findings in that acceptance increased only in the presence of escape extinction, suggesting that escape extinction was the treatment responsible for increases in acceptance. Thus, it may be necessary to extinguish the escape-maintained behavior to produce changes in compliance related to feeding problems.

Unlike the Dawson et al. (2003) study, however, the high-p procedure plus escape extinction did appear to produce beneficial effects relative to escape extinction alone with respect to inappropriate behavior for Kisha and Simone. That is, the high-p procedure plus escape extinction was associated with reduced levels of inappropriate behavior relative to escape extinction alone for both children.

Of note was that escape extinction alone was not effective clinically for Nick and Kisha. It is not clear why these results occurred, as numerous investigations have demonstrated the effectiveness of escape extinction as treatment for feeding problems (Ahearn et al., 1996; Cooper et al., 1995; Hoch, Babbitt, Coe, Krell, & Hackbert, 1994; Patel, Piazza, Martinez, Volkert, & Santana, 2002; Piazza, Patel, Gulotta, Sevin, & Layer, 2003). It also is not clear if the high-p sequence in the absence of escape extinction would have been effective for Nick or Kisha; the results of Simone's analysis and the data from Dawson et al. (2003) suggests not, given that acceptance did not increase until escape extinction was added to treatment.

Taken together, these results suggest that the high-p sequence may augment escape extinction during feeding treatment. Future studies should evaluate the high-p sequence under various functional (i.e., with and without escape extinction) and parametric controls to establish under what conditions high-p sequences are likely to be effective during feeding treatment in the absence of escape extinction. Future work might also directly test the effects of similar versus dissimilar test and training stimuli to establish the extent to which this variable contributes to the efficacy of the high-p sequence during the treatment of feeding problems.

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