The Assessment and Treatment of Inappropriate Self-Feeding

By

Alec M. Bernstein
MA, George Mason University, 2014
BS, James Madison University, 2012

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Chair: Pamela L. Neidert, PhD, BCBA-D

Claudia L. Dozier, PhD, BCBA-D

Derek D. Reed, PhD, BCBA-D

Kathryn J. Saunders, PhD

Nancy C. Brady, PhD

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The dissertation committee for Alec M. Bernstein certifies that this is the approved version of the following dissertation:

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Chair: Pamela L. Neidert, PhD, BCBA-D

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Abstract

Pediatric feeding disorders encompass an array of problematic feeding behaviors observed in early childhood. The effects of these behaviors range from mild (e.g., delayed social and developmental outcomes) to severe (e.g., significant weight loss, failure to thrive). Inappropriate self-feeding is one topography of pediatric feeding disorders with side effects considered mild, but these may worsen if left untreated, particularly for those diagnosed with developmental disabilities and certain health predispositions. Because assessment and treatment of pediatric feeding disorders often does not occur until the child exhibits severe health problems, there remains limited research on pediatric feeding disorders with mild and delayed effects such as inappropriate self-feeding. We evaluated the effects of response blocking as an assessment procedure to identify skill or motivation deficits for inappropriate self-feeding. We validated assessment results with differential treatment procedures matched to the deficit identified during the assessment. The matched treatment for a skill deficit included response blocking with backward chaining; the matched treatment for a motivation deficit included response blocking with and without differential reinforcement of alternative behavior. The assessment identified a skill deficit for four participants, a motivation deficit for two participants, and a potential interaction between a skill and motivation deficit for one participant. Overall, matched treatments validated assessment results. We discuss these results relative to the importance for a complete approach to assessment and treatment of all pediatric feeding disorders including future avenues of research to accomplish this.

Keywords: inappropriate self-feeding, motivation deficit, pediatric feeding disorder, response blocking, skill deficit

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"Moreover, the repertoire of behaviors that can be acquired without help by a single organism in a single lifetime is not very large." B. F. Skinner in *Upon Further Reflection* (1987, p. 3)

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Table of Contents

List of Figures

List of Table

The Assessment and Treatment of Inappropriate Self-Feeding

Pediatric feeding disorders are a heterogeneous set of developmentally inappropriate behaviors that impede the acquisition of appropriate feeding skills (Addison et al., 2012; Arvedson, 2008; Manikam & Perman, 2000; Gouge & Ekvall, 1975; Piazza & Roane, 2009; Silverman, 2010; Silverman, 2015). Side effects of these behaviors range on a continuum from mild (e.g., delayed social and developmental outcomes) to severe (e.g., significant weight loss; Benoit et al., 2000; Laud et al., 2009; Manikam & Perman, 2000). Although researchers widely report success in assessment and treatment of pediatric feeding disorders (Benoit et al., 2000; Williams et al., 2007), researchers have almost exclusively addressed behaviors (e.g., food refusal, food selectivity, inappropriate mealtime behavior) associated with more severe side effects – less is known about behaviors (e.g., inappropriate self-feeding) resulting in milder side effects. We evaluated assessment and treatment procedures for inappropriate self-feeding to increase appropriate self-feeding skills while mitigating the likelihood the effects of inappropriate self-feeding would increase in severity.

Pediatric Feeding Disorders

Pediatric feeding disorders encompass an array of problematic mealtime behaviors that typically develop within the child's first 3 years of life (Addison et al., 2012; Arvedson, 2008; Manikam & Perman, 2000; Gouge & Ekvall, 1975; Piazza & Roane, 2009; Silverman, 2010; Silverman, 2015). These behaviors are developmentally inappropriate (or age-inappropriate; Goday et al., 2019) and inhibit the acquisition of appropriate feeding skills (Arvedson, 2008; Silverman, 2010). These behaviors may also lead to the inability or refusal to consume adequate nutrients (Manikam & Perman, 2000; Palmer & Horn, 1978).

Pediatric feeding disorders are a common concern of parents of all children – typically and atypically developing (Kodak & Piazza, 2008). Between 5-35% of typically developing children present difficulties during mealtimes (Benjasuwantep et al., 2013; Cook et al., 2019; Esparó et al., 2004; Forsyth et al., 1985; Lindberg et al., 1991). These behaviors and related side effects are often mild and transitory (Benjasuwantep et al., 2013; Manikam & Perman, 2000; Stimbert et al., 1977). Atypically developing children who present these same difficulties are at a heightened risk for chronic complications (Kerwin & Eicher, 2004; Schreck et al., 2004; Shore & Piazza, 1997; Stimbert et al., 1977). Between 35-89% of atypically developing children present difficulties during mealtimes (Gouge & Ekvall, 1975; Sullivan et al., 2000). Additionally, feeding problems are a predominant feature of intellectual and developmental disabilities (IDD) such as autism spectrum disorder (ASD; Kodak & Piazza, 2008; Schreck et al., 2004; Sharp et al., 2013; Volkert & Vaz, 2010), and certain feeding behaviors in and of themselves are diagnoses in the Diagnostic and Statistical Manual of Mental Disorders (e.g., pica, rumination; American Psychiatric Association, 2013). Issues feeding are also prevalent in children with certain health predispositions (e.g., premature birth; Park et al., 2019; Patel, 2013) and neurological disorders (e.g., cerebral palsy; Calis et al., 2008; Gisel et al., 2000; Reilly et al., 1996). A behavioral approach to assessment and treatment of pediatric feeding disorders is empirically based and widely supported (Babbitt, Hoch, Coe, Cataldo, et al., 1994; Benoit et al., 2000; Bernal, 1972; Kerwin, 1999; Palmer et al., 1975; Shore & Piazza, 1997; Williams et al., 2007). Professionals recommend early, behavioral intervention to avoid the exacerbation of these behaviors and their side effects (Palmer & Horn, 1978; Patel, 2013; Piazza, 2008). Nonetheless, identifying when pediatric feeding disorders warrant intervention is difficult.

Pediatric feeding disorders include several topographies of problematic feeding behaviors such as food refusal (e.g., inappropriate mealtime behavior, expulsion, packing), food selectivity (of type and texture), rumination, dysphagia, and inappropriate self-feeding (Ahearn, 2003; Freeman & Piazza, 1998; Kadey et al., 2013; Manikam & Perman, 2000; Morris et al., 2017; Shore et al., 1998; Silverman, 2015). Effects of these behaviors range from short- to long-term, as well as on a continuum of severity from mild to severe (Benoit et al., 2000; Laud et al., 2009; Linscheid, 1992; Manikam & Perman, 2000; Morris et al., 2017; Palmer & Horn, 1978; Polan et al., 1991; Sevin et al., 2002). Mild effects are associated with behaviors such as inappropriate self-feeding. Mild feeding problems are generally fleeting and produce delayed outcomes (e.g., intellectual functioning and adaptive behavior delays, growth impairments; Babbitt, Hoch, & Coe, 1994; Gouge & Ekvall, 1975; Morris et al., 2017). These often require out-patient care and nonintrusive treatments that the child's pediatrician and local therapists are suited to manage (Anglesea et al., 2008; Laud et al., 2009; Sharp et al., 2012; Woods et al., 2013). Mild effect, however, may worsen if behavior persists. Severe effects are often associated with food refusal, food selectivity, inappropriate mealtime behavior, and rumination. Severe feeding problems produce effects that are often of immediate clinical significance. These issues tend to be chronic and potentially life threatening (e.g., failure to thrive; Frank & Zeisel, 1988). Children presenting severe feeding problems often require specialized treatment including admission to an in-patient unit specializing in pediatric feeding disorders and mechanical feeding apparatuses (Babbitt, Hoch, Coe, Cataldo, et al., 1994; Budd et al., 1992; Byars et al., 2003; Gorton & Hollis, 1965; Greer et al., 2008; Laud et al., 2009; Manikam & Perman, 2000; Palmer & Horn, 1978; Patel, 2013; Piazza & Roane, 2009; Polan et al., 1991; Sharp, Harker, et al., 2010). There are also several concomitant effects of any pediatric feeding disorder that extend beyond the child (Ivy et

al., 2018; Volkert et al., 2016). Caregivers have reported increased healthcare costs (Curtin et al., 2015; Piazza & Carroll-Hernandez, 2004; Rybak, 2015; Williams et al., 2007), financial difficulties (Milnes et al., 2013), heightened stress (Budd et al., 1992; Curtin et al., 2015; Greer et al., 2008; Kodak & Piazza, 2008; Silverman, 2010), and seclusion from social events (Kodak & Piazza, 2008). Feeding problems that require another individual to physically help the child eat (e.g., inappropriate self-feeding, inappropriate mealtime behavior) are also time consuming both in mealtime duration and caregiver participation (Berkowitz et al., 1971). Although professionals recommend early intervention for pediatric feeding disorders, children typically receive these services only when they present behaviors producing severe, negative effects (Hutchinson, 1999) – hence the feeding disorder literature almost exclusively includes assessment and treatment of topographies associated with more immediate, detrimental, and chronic health outcomes (Lewinsohn et al., 2005; Milnes & Piazza, 2013; O'Brien et al., 1991; Patel, 2013; Patel & Piazza, 2001; Polan et al., 1991; Sharp, Jaquess, et al., 2010). Less is known about the assessment and treatment of topographies that may produce delayed effects despite copious research suggesting atypically developing children are at a heightened risk for developing severe feeding problems, which can persist and worsen in the absence of intervention (Kerwin & Eicher, 2004; Piazza & Addison, 2007; Shore & Piazza, 1997; Schreck et al., 2004; Stimbert et al., 1977). Further evaluation of behaviors such as inappropriate self-feeding is critical to a comprehensive, proactive approach to the intervention of pediatric feeding disorders (Arvedson, 2008; Kerwin, 1999; Kerwin & Eicher, 2004; Ramsay, 2013; Stimbert et al., 1977; Wilkins et al., 2014).

Inappropriate Self-Feeding

Children engage in a progression of feeding skills over their first several years of life (Bruns & Thompson, 2010; Palmer & Horn, 1978). This progression begins with acceptance of liquids and continues through independent consumption of solid food (Stimbert et al., 1977). Requisite skills include hand-to-mouth fine-motor dexterity, typical swallowing capabilities, head control, and balance (Palmer & Horn, 1978). Carruth and colleagues (2004) conducted indirect assessments with a national random sample of over 3,000 caregivers with young children (4-24 months) to identify the ages at which children develop various motoric milestones, as well as compare energy and nutrient intake levels at these milestones. Regarding self-feeding, caregivers reported children typically used their fingers to grasp food around 7-8 months-of-age, removed food from a spoon when fed by a caregiver around 9-11 months-of-age, and self-fed using a spoon around 19-24 months-of-age. Inappropriate self-feeding is the persistent engagement in self-feeding behaviors typically observed of those younger (Berkowitz et al., 1971; Groves & Carroccio, 1971; Kerwin, 1999; O'Brien, Azrin, & Bugle, 1972; O'Brien, Bugle, & Azrin, 1972; Rivas et al., 2014; Sanders et al., 1993; Silverman, 2015; Stimbert et al., 1977; Zeiler & Jervey, 1968). Carruth and colleagues (2004) reported that children had higher energy and nutrient intake levels when they reached self-feeding milestones early, and appropriate self-feeding by 24 months-of-age nullified any energy and nutrient intake deficits amassed from inappropriately self-feeding (Carruth et al., 2004). Persistent inappropriate self-feeding (i.e., a child older than 24 months engaging in inappropriate self-feeding), however, can result in negative health, social, and developmental outcomes (Berkowitz et al., 1971; Carruth et al., 2004). To mitigate these potential outcomes, professionals approach assessment and treatment of inappropriate self-feeding by conceptualizing the behavior as a skill or motivation

deficit (Babbitt, Hoch, Coe, Cataldo, et al., 1994; Babbitt, Hoch, & Coe, 1994; O'Brien, Bugle, & Azrin, 1972; Piazza, 2008; Rivas et al., 2014).

Assessment: Identifying Skill and Motivation Deficits

A discriminative stimulus is an antecedent event that reliably signals the availability of reinforcement. Accurate responding is more likely to occur in its presence than in its absence. This pattern of responding suggests the discriminative stimulus has "control" (i.e., stimulus control; Morse & Skinner, 1958; Ringdahl et al., 2009; Skinner, 1963). Inaccurate responding indicates a lack of control by the programmed (i.e., trained) or putative (i.e., untrained but well-established) discriminative stimulus and is the effect of a skill deficit, a motivation deficit, or both (Lerman et al., 2004; Rivas et al., 2014; Volkert et al., 2016). Inaccurate responding in the presence of the putative discriminative stimulus despite additional prompts to engage in the appropriate response suggests a skill deficit (Lerman et al., 2004). Skill deficits include instances when an individual (a) has not acquired the behaviors to engaging in the accurate response or (b) lacks a learned history with the contingencies associated with this antecedent stimulus (Babbitt, Hoch, Coe, Cataldo, et al., 1994; Babbitt, Hoch, & Coe, 1994; Manikam & Perman, 2000). Motivation deficits include instances when an individual behavior is the function of an inappropriate learned history with reinforcement contingencies (i.e., faulty stimulus control; Babbitt, Hoch, Coe, Cataldo, et al., 1994; Lerman et al., 2004; Manikam & Perman, 2000). The individual has acquired the skill but he or she engages in the response at a lower level than a socially accepted or at inappropriate times (e.g., when the putative discriminative stimulus is absent; Babbitt, Hoch, & Coe, 1994). Manipulations to the reinforcer's efficacy alone should evoke accurate and decrease inaccurate responding.

Lerman and colleagues (2004) assessed skill and motivation deficits for common preacademic and receptive language skills for six children diagnosed with ASD. They evaluated the effects of a rapid skill assessment using a multiple baseline with reversals design across tasks. The rapid skill assessment included a baseline and three treatment conditions: differential reinforcement (a treatment for a motivation deficit), prompting (a treatment for a skill deficit), and prompting with reinforcement (a treatment for a combination of a motivation and a skill deficit). Correct responding included the initiation of an accurate response within 5 s of the therapist delivering the discriminative stimulus (i.e., task materials and vocal instruction) and the completion of that response within 10 s after initiation. All trials included the therapist delivering relevant materials and presenting a vocal instruction. During baseline, the therapist presented various relevant tasks and delivered no programmed consequences for correct or incorrect responding. The researchers then dichotomized tasks as either target tasks or maintenance tasks based on the participant's correct responding during baseline. Target tasks included those the child completed no more than 30% of trials. Maintenance tasks included those the child completed more than 80% of trials. The purpose of baseline was to identify tasks for which the presentation of the discriminative stimuli (i.e., trial materials and brief instruction) evoked correct responding. During differential reinforcement, the therapist interspersed target and maintenance tasks on a one-to-one ratio. Correct responding for the respective task resulted in reinforcement. Incorrect responding resulted in no programmed consequences. The therapist faded the ratio of target-to-maintenance tasks by increasing target and decreasing maintenance tasks contingent on stable responding. The purpose of the differential reinforcement condition was to assess whether the addition of programmed reinforcement increased correct responding in the presence of and in addition to the putative discriminative stimuli. The researchers

implemented baseline and differential reinforcement conditions for all participants. Differential reinforcement was effective, suggesting a motivation deficit, if correct responding increased to above 70% and this effect replicated across reversals. If differential reinforcement was ineffective, suggesting a potential skill deficit, the researchers implemented prompting. The prompting condition resembled baseline except the therapist simultaneously delivered the discriminative stimuli (i.e., trial material and brief instruction) with a prompt that was pre-identified to reliably increase the likelihood of correct responding for other behaviors. The purpose of the prompting condition was to assess the effects of additional prompting in the absence of reinforcement on correct responding. Prompting was effective, suggesting a skill deficit, if responding increased to the 70%-mastery criteria and this effect replicated across reversals. If prompting was ineffective, the researchers implemented prompting and differential reinforcement together. Prompting with reinforcement included both additional prompts and programmed reinforcement for correct responding. The purpose of this condition was to address both a motivation and a skill deficit by assessing responding under combined treatment procedures. The rapid skill assessment empirically identified deficits for all participants. One limitation of the fixed order of conditions, however, is the potential for carry-over effects. The potential influence of contingencies in a previous condition on responding in a subsequent condition limit the interpretation of each condition's individual effects. The researchers did mention they implemented the fixed order of conditions for practical and conceptual purposes. For example, prompts may be more intrusive and labor intensive than programmed delivery of reinforcement. Implementing prompting first, therefore, may be an inefficient use of time and resources, and prompting will likely be an ineffective treatment if responding is a motivation deficit. Lerman and colleagues suggested further evaluations of rapid skill assessments may

increase the social and experimental validity of discriminating between motivation and skill deficits and determine the generality of these procedures.

Duhon and colleagues (2004) conducted a brief skill assessment with four typically developing school children to identify whether underachievement in class was a skill or motivation deficit. Teachers referred participants for low scores in a single subject. The researchers first administered in-class probes to all students, regardless of participation in the study, to measure performance when teachers delivered instructions in the typical setting. Probes consisted of a 2-min math worksheet, a 1-min reading vignette, and a 3-min writing prompt. There were no programmed consequences for correct or incorrect responses. Researchers then brought those participating in the study to a separate room for a follow-up probe. The follow-up probe included a similar task to that during the probe of the subject for which the teacher referred the respective student. Researchers told participants they could choose from a prize box if they obtained a prespecified score. Mastery performance (i.e., obtaining the prespecified score) on the follow-up probe indicated a motivation deficit. Low or no change in performance on the follow-up probe indicated a potential skill deficit. The brief assessment identified a motivation deficit for two participants and a skill deficit for the other two participants. Researchers then implemented a feedback condition in which they administered similar tasks and immediately reported the participant's score to him or her following completion. This resulted in no behavior change. Next, the researchers prescribed matched and unmatched interventions in an alternating treatments design to validate assessment results and increase correct responding. The matched treatment for a motivation deficit included differential reinforcement for correct responding (similar to the assessment). The matched treatment for a skill deficit included prompting procedures. Unmatched treatments included the treatment for the deficit not identified by the

assessment (i.e., differential reinforcement for a skill deficit or prompting procedures for a motivation deficit). The matched treatment increased performance to mastery for all four participants. These results further Lerman et al.'s (2004) work in validating a brief assessment to identify skill and motivation deficits. Additionally, Duhon and colleagues' (2004) use of both matched and unmatched treatments strengthened the validity of their assessment over the use of just a matched treatment. Their procedures were brief, and effects were immediate. This increases the social validity of the procedures. Nonetheless, although correct responding immediately increased and maintained at a high level following the skill-based treatment for those participants whose assessment identified a skill deficit, correct responding during the motivation-based treatment remained lower. These differential levels of responding suggest that once the participant acquired the related skill, low responding during other conditions may have been due to a motivation deficit. Addressing deficits as and when presented would have furthered the generality and validity of the procedures, especially considering the researcher's experimental question was clinically focused.

Regarding self-feeding, the presentation of food and instruction to self-feed serve as putative discriminative stimuli for appropriate self-feeding. Inappropriate self-feeding in the presence of these stimuli suggest a skill deficit, a motivation deficit, or both. O'Brien, Bugle, and Azrin (1972) not only offer one of the only empirical evaluation of functional relations between environmental variables and inappropriate self-feeding, but they are the only to describe an evaluation of skill and motivation deficits for inappropriate self-feeding. O'Brien, Bugle, and Azrin (1972) implemented response blocking as an assessment procedure to identify inappropriate self-feeding as a skill or motivation deficit for a 6-year-old female diagnosed with IDD. The researchers task analyzed appropriate self-feeding into six components: pick up spoon,

scoop food, spoon to mouth, open mouth, deposit food into mouth, and remove spoon from mouth and bring spoon down to the bowl. Appropriate self-feeding included the successive completion of the response chain. Inappropriate self-feeding included any other self-feeding modality as well as unsuccessful attempts to appropriately self-feed. The researchers used a reversal design to evaluate the effects of response blocking. During baseline, inappropriate and appropriate self-feeding resulted in no programmed consequences. During response blocking, inappropriate self-feeding resulted in blocking (i.e., the therapist placed his or her hand between the food and the participant's mouth, and the therapist then removed any food from the participant's grasp); appropriate self-feeding continued to result in no programmed consequences. Blocking inappropriate self-feeding increased the efficacy of food as a reinforcer by creating a sense of deprivation (i.e., only one feeding modality now resulted in access to food). Response allocation across appropriate and inappropriate self-feeding throughout the assessment indicated skill and motivation deficits. Results of the brief assessment revealed appropriate self-feeding was at a zero level across baseline and response blocking conditions. The researchers anecdotally noted that inappropriate self-feeding was at a high level during baseline and immediately decreased during response blocking. These data suggest a skill deficit – response blocking inappropriate self-feeding did not evoke appropriate self-feeding even though appropriate self-feeding was the only feeding modality resulting in access to food. The researchers would have identified a motivation deficit if response blocking inappropriate self-feeding evoked appropriate self-feeding. O'Brien, Bugle, and Azrin, however, could have strengthened their findings by providing direct measures of inappropriate self-feeding. They also limited their experimental control by only implementing an A-B-A design across one participant. A multiple baseline design and further reversals would have increased experimental control.

Nonetheless, the assessment informed a subsequent intervention that included teaching procedures to increase appropriate self-feeding and continued response blocking to maintain a low level of inappropriate self-feeding. Overall, O'Brien, Bugle, and Azrin (1972), Lerman et al. (2004), and Duhon et al. (2004) describe several procedures to identify skill and motivation deficits, as well as the generality and utility of this method.

Treatment

General interventions for inappropriate self-feeding often include contingent response blocking. Response blocking is the interruption of a behavior to decrease the likelihood the behavior results in reinforcement and, therefore, decrease the future likelihood of this behavior. Researchers have implemented response blocking as the sole independent variable (e.g., McCord et al., 2005; O'Brien, Azrin, & Bugle, 1972; O'Brien, Bugle, & Azrin, 1972; Reid et al., 1993) and supplemented with more direct procedures to increase desired behavior (e.g., Call et al., 2011; Carr et al., 2002; DeLeon et al., 2008). Regarding motivation deficits, interventions often include response blocking with or without additional restructuring of environmental stimuli (i.e., antecedents and consequences) to decrease inappropriate and evoke appropriate self-feeding. Regarding skill deficits, interventions often include response blocking to decrease inappropriate self-feeding and systematic teaching procedures to increase the skills required to appropriately self-feed. Researchers have task analyzed appropriate self-feeding into discrete component behaviors and have typically taught these component behaviors using prompt fading (i.e., backward chaining; Berkowitz et al., 1971; Gorton & Hollis, 1965; O'Brien, Bugle, & Azrin, 1972). Backward chaining includes systematic fading of prompts from the last component to the first component of the response chain contingent on some predetermined mastery criteria for accurate responding.

Gorton and Hollis (1965) outlined the structural and procedural blueprints of an in-patient unit for children with severe IDD. As half their clients exclusively engaged in inappropriate self-feeding, the researchers described the general training procedures they used to increase these children's appropriate and decrease their inappropriate self-feeding. Training included the researchers task analyzing appropriate self-feeding into four components – pick up spoon, scoop food, spoon to mouth, and take bite – and teaching these skills using backward chaining. Inappropriate self-feeding always resulted in response blocking. All nine children eventually mastered the skills to appropriately self-feed. The article, however, was less of an empirical study (the researchers did not report specific data) and more of a brief, informative outline of an out-patient clinic. Berkowitz and colleagues (1971) also taught children self-feeding skills. They equally separated 14 children into an immediate-intervention and a delayed-intervention group. The researchers task analyzed appropriate self-feeding as five components: pick up spoon, scoop food, spoon to mouth, take bite, and spoon to bowl. Successful, successive completion of each available component resulted in vocal praise and physical touch (e.g., back rubs). Inappropriate self-feeding resulted in response blocking. All participants learned to appropriately self-feed through backward chaining. Participants in the immediate-intervention group learned to appropriately self-feed between 2 and 21 days; participants in the delayed-intervention group learned to appropriately self-feed between 13 and 60 days. Additionally, 10 of 14 participants maintained the acquired self-feeding skills during a 41-month follow-up observation. Only four of those participants who initially maintained these skills, however, continued to do so during a second 23-35-month follow-up observation. Decreases in skill maintenance suggest a potential motivation deficit. Berkowitz and colleagues did not report assessment procedures, but an ongoing assessment of skill and motivation deficits may have identified such pattern of

responding to further suggest different intervention procedures. Intervention procedures for a motivation deficit can include (a) continued response blocking to decrease inappropriate self-feeding and to establish appropriate self-feeding as the only self-feeding modality resulting in food, (b) programmed, additional reinforcers delivered contingent on appropriate self-feeding and withheld contingent on inappropriate self-feeding (i.e., differential reinforcement of alternative behavior [DRA]), and (c) a combination of both. Like Gorton and Hollis (1965), Berkowitz et al. (1971) provided a limited technological description of their intervention procedures and only provided a written report of the results. Both also exclusively described intervention procedures. Replication of these effects and further evaluation of environmental events affecting acquisition and maintenance of appropriate self-feeding skills may require a more well-documented and comprehensive approach.

O'Brien, Bugle, and Azrin (1972) are the only researchers to directly evaluate skill and motivation deficits for inappropriate self-feeding. We previously described O'Brien, Bugle, and Azrin's assessment procedures. In brief, the researchers implemented response blocking contingent on inappropriate self-feeding to evaluate a young child's allocation of responding across appropriate and inappropriate self-feeding. Appropriate self-feeding included the successive, accurate completion of the six-component response chain: pick up spoon, scoop food, spoon to mouth, take bite, remove spoon from mouth and consume food, and spoon back down to bowl. Inappropriate self-feeding included any other self-feeding modality. Inappropriate self-feeding was high and appropriate self-feeding was low during baseline conditions. Inappropriate self-feeding decreased, and appropriate self-feeding remained low, during response blocking. This pattern of responding suggested a skill deficit. The researchers then implemented a matched intervention for a skill deficit: continued response blocking to maintain a low level of

inappropriate self-feeding and backward chaining to teach the component behaviors of appropriate self-feeding. The researchers evaluated the effects of backward chaining and response blocking using a reversal design with embedded baseline probes. Backward chaining with response blocking resulted in a low level of inappropriate self-feeding and a high level of accurate responding for available component behaviors. Baseline probes, however, resulted in a high level of inappropriate self-feeding and a zero level of appropriate self-feeding. Inappropriate self-feeding immediately decreased and appropriate self-feeding immediately increased when the researchers implemented response blocking contingent on inappropriate self-feeding during baseline probes. A reversal to typical baseline contingencies replicated a high level of inappropriate and a low level of appropriate self-feeding. Following backward chaining, the researchers reversed to a response blocking only condition, which was similar to the response blocking condition of the assessment. Response blocking alone resulted in a low level of inappropriate and a high level of appropriate self-feeding. Another reversal to baseline resulted in a high level of inappropriate and low level of inappropriate self-feeding. This pattern of responding suggested two implications. One, the participant acquired the skills to appropriately self-feed throughout backward chaining. The researchers validated assessment results and treated the participant's skill deficit. Two, the participant's continued inappropriate self-feeding in the absence of response blocking may have become a motivation deficit after learning the skills to appropriately self-feed. The researcher's, however, may have concluded the study prematurely. The study concluded under baseline contingencies with appropriate self-feeding on a decreasing trend. Establishing and maintaining a high level of appropriate self-feeding would have increased the social validity of the study's outcomes, validated a potential motivation deficit, and strengthened the conclusions of an ongoing assessment and treatment. The addition of a

programmed reinforcer for appropriate self-feeding may have help establish these results. The current results, nonetheless, suggest (a) the validity of response blocking as an assessment procedure to identify skill and motivation deficits of inappropriate self-feeding, (b) backward chaining is a successful, matched intervention for a skill deficit, (c) response blocking may be a required component of treatment to maintain a low level of inappropriate self-feeding regardless of skill or motivation deficits, and (d) an increase in appropriate self-feeding may be a concomitant effect of response blocking inappropriate self-feeding. Further identifying efficacious environmental manipulations to teach and maintain self-feeding skills is a socially significant, empirical question in need of addressing (Shore & Piazza, 1997).

Purpose

The purposes of the current study were to evaluate response blocking as an assessment procedure to identify skill and motivation deficits of inappropriate self-feeding, and then to validate assessment results with differential treatment procedures matched to the deficit identified. The matched treatment for a skill deficit included response blocking with backward chaining; the matched treatment for a motivation deficit included response blocking with and without programmed DRA.

Method

Participants, Settings, and Materials

Parents, staff, and researchers referred children to the current study. Trained researchers then conducted direct observations of each referred child's mealtime behavior. If the direct observation suggested the child (a) engaged in appropriate mealtime behavior (i.e., absence of problem behavior), (b) accepted multiple types and textures of food (i.e., absence of food refusal and selectivity), and (c) presented inappropriate self-feeding behaviors, we obtained consent

from a legal guardian for the child's participation in the current study. All legal guardians (i.e., 100%) consented. We referred all children presenting more severe feeding problems to other appropriate studies or clinical interventions. We ruled out any potential biological causes to the child's inappropriate self-feeding for the remaining participants. Although there were no inclusion criteria regarding developmental level and diagnosis, all participants were of atypical development. In fact, there were several typically developing children referred to the study, but appropriate self-feeding emerged before researchers concluded observations and obtained consent (this anecdotal information further indicates that inappropriate self-feeding is often a transient issue when presented by typically developing children). We enrolled seven total participants in the current study. All seven participants completed the assessment; six participants continued through treatment. All participants attended one of three behavior-analytic programs: an inclusive university-based child development center or one of two early-intervention clinics. We conducted 1-6 sessions per day, 3-5 days per week, within the participant's typical mealtime setting and during the typical mealtime. Sessions for those participants enrolled in the child development center occurred within the classroom and during scheduled times at which teachers served the children a family-style meal prepared by an on-site cook. The researchers included food prepared by the on-site cook during sessions whenever possible to emulate the standard mealtime process. Sessions for those enrolled in the early-intervention clinic settings occurred during the participant's scheduled mealtime, which often included the presence of other children, staff, and activities. The researchers included food packed by the participant's caregivers whenever possible to emulate the standard mealtime process. Across all settings, each session included one type of food for which consumption using a spoon was appropriate (e.g., cereal, canned fruit), but the food varied across sessions. All food

was solid and cut into small pieces (if needed) – this reduced potential confounds such as food (e.g., yogurt) sticking to the utensil while allowing the participant to consume the amount of food he or she typically would during mealtime. If none of the food prepared by the cook or packed by caregivers met these criteria, the researchers delivered food (e.g., cereal) stored on-site that did meet these criteria. Although we did not account for food preference, we included the same foods typically presented during mealtime. If we repeatedly observed low preference for a specific food (likely indicated by repeated low self-feeding and problem behavior only in the presence of this food), we would have conduced pre-session preference assessments. We never observed this pattern of responding. Participants also had noncontingent access to water throughout all sessions. Access to an entire meal consisting of the remainder of the family-style or caregiver-packed meal followed each session. Each setting's governing internal review board approved all procedures.

Antonia was a 3-year-old female, born premature, and diagnosed with global developmental delays (GDD). She consumed a variety of food but exclusively engaged in inappropriate self-feeding. Antonia attended the child development center. Elliot was a 1-year 4-month-old male diagnosed with Down syndrome. He consumed a variety of food. Although often fed by an adult, he exclusively engaged in inappropriate self-feeding when given the opportunity. Elliot attended the child development center. Roy was a 4-year 3-month-old male diagnosed with autism. He consumed a variety of food but exclusively engaged in inappropriate self-feeding. Roy received intensive, behavior-analytic services at one of the early-intervention clinics. Josh was a 2-year 8-month-old male diagnosed with GDD with the possibility of Fetal Alcohol Syndrome. He consumed a variety of food and both inappropriately and appropriately self-fed throughout meals. Josh received intensive, behavior-analytic services at one of the early-

intervention clinics. Trevor was an 8-year 4-month-old male diagnosed with autism. He consumed a variety of food and both inappropriately and appropriately self-fed throughout meals. Trevor received intensive, behavior-analytic services at one of the early-intervention clinics. Mowgli was a 5-year 1-month-old male diagnosed with autism. He consumed a variety of food but exclusively engaged in inappropriate self-feeding. Mowgli received intensive, behavior-analytic services at one of the early-intervention clinics. Jefferson was a 4-year 5-month-old male diagnosed with autism. He consumed a variety of food but exclusively engaged in inappropriate self-feeding. Jefferson received intensive, behavior-analytic services at one of the early-intervention clinics.

Researchers collected data using pencil and paper and used a timer to objectively measure session duration. Researchers also weighed all food using a food scale before and after the session. Therapists (i.e., those implementing procedures) wore latex gloves and had access to napkins and wipes to clean the participant's face and surrounding area if needed. Participants sat in an appropriately sized chair and at an appropriately sized table. A cup of water was available noncontingently, and therapists presented food (about enough food for the session) in a bowl with an appropriately sized spoon.

Response Measurement

The primary dependent variables were appropriate and inappropriate self-feeding. *Appropriate self-feeding* (i.e., using a spoon to self-feed) was the accurate and successive completion of its four response chain components: pick up spoon, scoop food, spoon to mouth, and take bite. *Pick up spoon* included the participant grasping the spoon with his or her hand completely removing the spoon off the original surface. *Scoop food* included the participant moving the spoon in a side-to-side, front-to-back, or back-to-front motion within the bowl such

that food previously in the bowl was now on the spoon. *Spoon to mouth* included the participant bringing the spoon from the bowl to within 1 in. of his or her mouth. *Take bite* included the participant depositing food from the spoon into his or her mouth (i.e., breaking the plane of the lips). We scored responding for each response chain component as *accurate, completed, prompted,* or *inaccurate (or no responding). Accurate responding* included the participant independently completing the component within 5 s of the previous component (or within 5 s of the therapist's vocal prompt, "Take a bite," and presentation of the food for the first component, pick up spoon). The participant did not need to accurately complete the previous component for the researcher to score the subsequent as accurate. *Completed responding* included the participant independently completing the component after the 5-s criteria but before the conclusion of the trial. *Prompted responding* included the participate completing the component with the therapist's physical guidance. *Inaccurate or no responding* included the participant (a) initiating but not completing the component response, (b) completing a form of the response not following the definition (e.g., using fingers to assist scooping food), and (c) engaging in responses other than the component response. Again, we defined appropriate self-feeding as the accurate and successive completion of each response chain component. We measured whether accurate responding for each response chain component and appropriate self-feeding occurred on a trial-by-trial basis, and we analyzed these data as percentage of trials by dividing the number of trials with appropriate self-feeding (accurate responding when applicable) by the total number of trials, and multiplying by 100. Our conceptualization and definition of appropriate self-feeding aligned with those within the self-feeding literature; discriminating between an accurate (i.e., responding before 5-s criteria) and completed response (i.e., responding after 5-s criteria) aligned with previous stimulus control literature (Graf & Auman, 2005; Saunders, 2011). Analyzing

accurate responding on each component of the response chain also allowed for a comprehensive analysis of self-feeding behavior.

Inappropriate self-feeding included any self-feeding modality other than accurate use of the spoon (i.e., appropriate self-feeding). Although this accounted for behaviors such as the participant bringing his or her mouth down to bowl or the bowl up to his or her mouth, we primarily observed participants to use their fingers to self-feed. We measured the frequency-per-trial of inappropriate self-feeding, and we analyzed these data as a total count by tallying the total number of occurrences of inappropriate self-feeding during a session. Measuring frequency allowed us to assess direct correspondence between inappropriate self-feeding and response blocking.

We also collected data on several ancillary behaviors (i.e., problem behavior, consumption, and expulsion). *Problem behavior* included whining or crying for at least 10 s, attempting to leave the immediate environment, and engaging in inappropriate mealtime behavior (e.g., throwing food, refusing prompts). We measured problem behavior using partial-interval recording by denoting whether problem behavior during a trial, and we analyzed these data as the percentage of trials with which the behavior occurred by dividing the number of trials of problem behavior by the total number of trials, and multiplying by 100. *Consumption* was the amount of food the participant ate during a session. We measured consumption in grams, and we analyzed these data by subtracting the weight of the bowl with food after a session from that from before a session. *Expulsion* included any instance that food exited the participant's mouth by breaking the plane of the lips. We measured the frequency-per-trial of expulsion, and we analyzed these data as a total count by tallying the total number of occurrences of expulsion during a session.

Furthermore, we collected data on therapist behaviors, which included self-feeding prompts (i.e., "Take a bite"), physical and vocal prompts for response chain components, response blocking, and reinforcer delivery. *Self-feeding prompts* included a single vocal instruction from the therapist to the participant to take a bite, and these occurred at the start of each trial (i.e., within 2 s of food presentation and before the child initiated the response chain). *Component prompts* included the therapist's vocal and simultaneous physical prompt to engage in the given response chain component. We measured self-feeding and component prompts by recording whether the therapist correctly prompted the participant on a trial-by-trial basis. We analyzed these data as the percentage of trials by dividing the number of trials with correct implementation of prompts by the total number of trials and multiplying by 100. *Response blocking* included the therapist gently guiding food away from the participant's mouth and dislodging food from the participant's hand when necessary contingent on inappropriate self-feeding. We measured response blocking as a frequency count and analyzed these data as the percentage of opportunities by dividing the frequency of response blocking by the frequency of inappropriate self-feeding and multiplying by 100. *Reinforcer delivery* included the therapist giving the participant about 15-s access to a predetermined high-preferred item. Correct implementation included the delivery of these items during intervention conditions and the absence of their delivery during baseline. We measured reinforcer delivery as occurring or not occurring on a trial-by-trial basis and analyzed these data as the percentage of trials by dividing the number of trials by the number of correct reinforcer delivery by the total number of trials and multiplying by 100.

Procedures

General

We evaluated response blocking as an assessment procedure to identify skill and motivation deficits for inappropriate self-feeding. Assessment results indicated a skill deficit if appropriate self-feeding remained low during response blocking of inappropriate self-feeding. This pattern of responding suggested the skills to appropriately self-feed were not yet within the participant's repertoire. Assessment results indicated a motivation deficit if response blocking of inappropriate self-feeding evoked appropriate self-feeding or increased existing appropriate self-feeding to a near-mastery level. This pattern of responding suggested the skills to appropriately self-feed were within the participant's repertoire, but he or she only engaged in these behaviors in the presence of a specific establishing operation (i.e., deprivation [decreased access] to food). We then validated assessment results with treatment procedures matched to the deficit identified during the assessment. The matched treatment for a skill deficit included continued response blocking with backward chaining. The matched treatment for a motivation deficit included continued response blocking with and without programmed DRA.

Sessions were 20 trials. Trials were 30 s with two 15-s segments: food present and food absent. Therapists delivered the bowl of food and a spoon, started the session timer, and immediately delivered the vocal prompt, "Take a bite," to initiate the 15 s of food presentation. All data collection occurred during the 15 s of food presentation. Therapists reset the session timer, removed all session stimuli, and initiated the 15-s food absent segment (i.e., the intertrial interval; ITI) following the participant engaging in the target responses or the 15 s of food presentation expired, whichever occurred first. Therapists delivered any programmed reinforcers during the 15-s ITI. The ITI also allowed the participant time to consume accepted food. At the end of the 15-s ITI, therapists removed any programmed reinforcers and conducted a clean-mouth check (i.e., vocally prompting the participant to open his or her mouth and, if necessary,

using a flipped spoon to prompt the participant to open his or her mouth). Clean-mouth checks functioned as an antecedent procedure to ensure the establishing operation was present to engage in self-feeding on the succeeding trial. Therapists, therefore, only initiated the next trial if there was less than a pea-size of food in the participant's mouth during the clean-mouth check; otherwise, therapists allowed another 5 s to consume food before checking again. Most participants consumed their food within the 15-s ITI. We implemented a 5-s ITI without a clean-mouth check with Antonia until her final baseline condition, at which point we implemented the 15-s ITI with a clean-mouth check.

If the participant attempted to leave the table, the therapist removed all session stimuli, paused the session timer, and physically prompt the participant to sit back down. Once reseated, the therapist represented session stimuli (without the vocal prompt, "Take a bite") and restarted the session timer. If the participant spilled the bowl of food, the therapist removed all session stimuli, paused the session timer, and moved all spilled food out of the participant's reach. The therapist refilled and reweighed the bowl if the participant spilled more than half of the food. Once the area was clean (and the therapist reweighed the bowl if needed), the therapist re-presented session stimuli (without the vocal prompt, "Take a bite") and restarted the session timer. Research assistants included spilled food in the final weighing of the bowl for an accurate measure of consumption. Additionally, therapists established an environment that decreased the likelihood of inappropriate mealtime behavior (e.g., sitting between participant and closest peer, ensuring non-session stimuli are out of reach) and attempts to self-feed during the ITI (e.g., ensuring all food was removed and out of arms reach, any attempts were blocked). Again, research assistants only collected data during the initial 15 s of the trial when food was present.

Mastery criteria for self-feeding was at least three consecutive sessions with a (a) minimum of 80% of opportunities with appropriate self-feeding, and (b) near-zero level of inappropriate self-feeding. Criteria for changing conditions depended on the condition – we describe these in the relevant sections below. Session termination criteria included 10 consecutive trials of problem behavior (e.g., whining and crying). We delayed the delivery of a full meal by 5 min following terminated sessions to avoid inadvertently reinforcing problem behavior (i.e., escape from session). We terminated two sessions for Elliot and three sessions for Roy.

Assessment

We first assessed whether contingent response blocking for inappropriate self-feeding identified skill and motivation deficits. We evaluated the effects of response blocking as an assessment procedure using a multiple baseline across participants design with embedded reversals.

Baseline. The therapist delivered the vocal prompt to take a bite, started the session timer, and immediately deliver the bowl of food and a spoon to initiate each trial. The food-present segment of the session lasted 15 s or until the participant appropriately self-fed, whichever occurred first. The therapist then removed all session stimuli, restarted the session timer, and initiated the 15-s ITI. Appropriate self-feeding resulted in brief praise. Inappropriate self-feeding and expulsion resulted in no programmed consequences. The therapist blocked all problem as needed. Baseline represented the participant's typical mealtime environment in which teachers and therapists delivered brief praise often for appropriate behaviors but did not intervene on specific feeding behaviors unless instructed.

Response Blocking. The therapist conducted response blocking sessions similar to baseline with the exception that any attempt to inappropriately self-feed resulted in the therapist gently redirecting the food away from the participant's mouth and dislodging any food from the participant's hand as needed. The therapist initiated blocking only once the participant brought food within 1 in. of his or her mouth. This ensured that the participant's response met the definition for inappropriate self-feeding, and, therefore, met criteria for response blocking. Response blocking served as the test condition from which we compared response allocation across appropriate and inappropriate self-feeding to that of baseline.

Treatment

Treatment served two purposes: to validate assessment results and to increase appropriate and decrease inappropriate self-feeding. We differentially prescribed treatments that matched the deficit identified during the assessment to address both purposes. We implemented continued response blocking and backward chaining as treatment for a skill deficit. We implemented (a) extended exposure to response blocking for a motivation deficit in which the response blocking condition during the assessment increased responding to mastery, and (b) extended exposure with supplemented, programmed differential reinforcement for a motivation deficit in which the response blocking condition during the assessment did not increase responding to mastery or extended exposure alone did not maintain mastery-level responding.

Preference Assessment. We implemented a multiple-stimulus-without-replacement preference assessment (MSWO; DeLeon & Iwata, 1996) or a paired-stimulus preference assessment (PSPA; Fisher et al., 1992) to identify high-preferred tangible items for each participant. Therapists delivered these tangible items contingent on appropriate self-feeding and accurate responding as prescribed. We referred to conditions where the therapist contingently

delivered a high-preferred item as one with “programmed” reinforcement to differentiate the supplemental delivery of this putative conditioned reinforcer from access to the primary reinforcer of food. We conducted an MSWO with participants we observed to consistently scan their environment and a PSPA with participants we observed to have difficulty scanning. The participant’s behavior technician or teacher identified 5-10 items for inclusion in the participant’s respective preference assessment.

During an MSWO, the therapist simultaneously presented the participant with all items previously identified by the behavior technician or teacher. The therapist placed each item an equal distance from one another and an equal distance from the participant’s reach. During pre-session exposure, the therapist prompted the selection (i.e., touching) of each item using a least-to-most prompting hierarchy and allowed the participant to engage with the selected item for about 30 s. Following pre-session exposure, the therapist conducted MSWO sessions by rearranging and representing the items, re-prompting the participant to select one, and allowing 3-5 s for a response. Selection of an item resulted in 30-s access to that item and the therapist rearranging the remaining, unselected items. No selection resulted in the therapist re-prompting the participant to pick one. Again, selection of an item resulted in 30-s access to that item and the therapist rearranging the remaining, unselected items. Three no selections in a row resulted in termination of the MSWO – this never occurred. The therapist blocked all attempts to select more than one item and re-presented the vocal instruction to pick one. This process continued until the participant had the opportunity to select each item. The therapist conducted three MSWOs using the same stimuli to replicate and validate the previous findings. We then ranked items by order of selection within an MSWO and averaged rankings across MSWOs. The

therapist delivered the highest preferred item (i.e., the item consistently picked earliest in the array) contingent on the target behavior during treatment sessions when prescribed.

During a PSPA, the therapist conducted pre-session exposure similar to the MSWO except he or she presented each item individually. Following pre-session exposure, the therapist conducted PSPA sessions by simultaneously presenting a pair of items to the participant. These items were next to one another and an equal distance from the participant's reach. The therapist prompted the participant to pick one of the items and allowed 3-5 s for a response. Selection of an item resulted in 30-s access to that item and the removal of the remaining item. No selection resulted in the therapist re-prompting the participant to pick one. Again, selection of an item resulted in 30-s access to that item and the therapist removing the remaining item. Three no selections in a row resulted in termination of the PSPA – this never occurred. The therapist blocked all attempts to select more than one item and re-presented the vocal instruction to pick one. The therapist paired each item with one another, and the therapist presented each pair three times. We then created a preference hierarchy by tallying how often the participant selected each item. If the participant selected two or more items same number of times, we evaluated within-trial data. The item selected more when the therapist presented the two as a pair became the higher preferred item. The therapist delivered the highest preferred item (i.e., the item selected most) contingent on the target behavior during treatment sessions when prescribed.

Skill Deficit: Backward Chaining with Response Blocking and Programmed DRA. We prescribed backward chaining with response blocking and programmed DRA – programmed reinforcement for accurate responding – as treatment for those participants with whom their assessment identified a skill deficit. We used a multiple baseline design across components to assess the effects of this intervention on inappropriate and appropriate self-feeding and each

component of the appropriate self-feeding response chain. The therapist initially conducted a full-physical guidance phase where he or she presented session materials and immediately vocally and physically (i.e., hand-over-hand) prompted the participant through each response chain component in succession. Compliance with prompts and acceptance of food resulted in brief praise and the programmed reinforcer. Inappropriate self-feeding resulted in response blocking. The purpose of the physical guidance phase was to acquaint the participant with accurate responding for each response chain component successively and the programmed reinforcement contingency for doing so.

Following full-physical guidance, the therapist systematically faded prompts across appropriate self-feeding components. The therapist first targeted the last component of the response chain for accurate responding. The therapist presented session materials an immediately physically and vocally prompted the first three components of the response chain (i.e., pick up spoon, scoop food, and spoon to mouth) and allowed accurate responding for the final component (i.e., take bite). Accurate responding resulted in brief praise and the programmed reinforcer. Inaccurate and no responding by the 5-s criteria resulted in vocal and physical prompting for take bite. There was no opportunity for responding following the 5-s criteria. Mastery responding for take bite resulted in the therapist fading prompts and targeting the third component of the response chain. The therapist then provided physical and vocal prompts for the first two components of the response chain (i.e., pick up spoon and scoop food) and allowed accurate responding for the latter two components (i.e., spoon to mouth and take bite). Accurate responding for spoon to mouth and take bite resulted in brief praise and the programmed reinforcer. Incorrect responding on spoon to mouth resulted in the therapist physically and vocally prompting spoon to mouth but allowing accurate responding for take bite. Incorrect

responding for on take bite resulted in the therapist physically and vocally prompting take bite. The therapist withheld the delivery of the programmed reinforcer following completion of the response chain if the participant required additional prompting for either component for which accurate responding was available. Inappropriate self-feeding continued to result in response blocking. Following mastery levels of responding for both components, the therapist further faded prompts to target the second component of the response chain (i.e., scoop food). This process continued until the participant mastered each component of the response chain and, therefore, engaged in appropriate self-feeding. The purpose of these phases was to systematically measure skill acquisition during backward chaining. Some participants required idiosyncratic exceptions and additions to these procedures.

For Antonia, we implemented vocal and physical prompting for the component response for which inaccurate or no responding occurred and all subsequently mastered components. Antonia, therefore, did not have the opportunity to engage in accurate responding for previously mastered components once inaccurate or no responding occurred for an earlier component of the response chain. This differed from our general procedures as, for all other participants, we implemented additional prompting only for the specific component behavior for which the participant engaged in inappropriate or no responding. Antonia was our first participant in the study. Her case informed procedures for future participants. Elliot continued to turn his wrist which resulted in food falling off the spoon before he could deposit the food into his mouth. For Elliot, we implemented most-to-least prompt fading when we targeted spoon to mouth. We initially physically (i.e., hand-over-hand) and vocally prompted the response of scooping food. Following a mastery level of responding, we faded prompts to hand-over-wrist, then hand-over-forearm, and then hand-over-elbow until Elliot was able to accurately bring the spoon with food

to his mouth. Most-to-least prompt fading served as additional prompting to standard backward chaining procedures to increase Elliot's accuracy of this skill. Jefferson engaged in behavior indicating potential prompt dependency. For Jefferson, we implemented a response cost with and without high-quality attention as the programmed reinforcer in addition to the high-preferred item identified by the preference assessment. During response cost, inaccurate or no responding resulted in the therapist terminating the 15-s food-present portion of the trial and immediately initiating the 15-s ITI. We implemented a response cost to avoid potential prompt dependency. Further, we supplemented high-quality attention as a programmed reinforcer to increase the likelihood Jefferson would engage in accurate responding.

We included baseline probes following at least mastery of each component to evaluate ongoing performance in the absence of programmed prompts and reinforcement (i.e., maintenance of effects). The therapist continued baseline contingencies if inappropriate self-feeding remained at a near-zero level and appropriate self-feeding increased to 75% of the mastery criterion (i.e., 60% of opportunities with appropriate self-feeding) during the baseline probe. The therapist continued backward chaining if responding did not meet these criteria. We implemented these criteria for all participants other than Antonia and Elliot. For Antonia and Elliot, the therapist only continued baseline contingencies if inappropriate self-feeding remained at a near-zero level and appropriate self-feeding was above 80% of opportunities.

Motivation Deficit: Response Blocking with and without Programmed DRA. We prescribed one of two treatment procedures for those participants with whom their assessment identified a motivation deficit. The first treatment was an extended response blocking condition. We implemented extended response blocking for participant's whose inappropriate self-feeding decreased to a near-zero level and appropriate self-feeding increased at least a level of 75% of

the mastery criterion (i.e., an average of 60% of opportunities with appropriate self-feeding) during either response blocking condition during the assessment. This condition mirrored that of the response blocking condition of the assessment. The second treatment was extended response blocking with programmed DRA – programmed reinforcement for appropriate self-feeding. We implemented extended response blocking with DRA for participant's whose patterns of responding (a) did not meet the criteria during the assessment warranting extended response blocking only, or (b) did not increase to, or maintain at, mastery levels during the extended response blocking condition. We conducted response blocking with DRA sessions similar to the response blocking condition except appropriate self-feeding now resulted in the delivery of brief praise and the programmed reinforcer, and similar to that of the intervention for a skill deficit with the exception that the teaching procedure (i.e., backward chaining) was omitted. We supplemented programmed DRA to increase the potential efficacy of the reinforcing consequences for appropriate self-feeding.

Reliability and Procedural Integrity

A second, independent data collector collected reliability data for all dependent variables for between 33-100% of sessions for Jefferson, 33-100% of sessions for Mowgli, 38-50% of sessions for Roy, 35-38% of sessions for Josh, 37-42% of sessions for Trevor, 33-51% of sessions for Elliot, and 35-74% of sessions for Antonia. We calculated trial-by-trial interobserver agreement (IOA) for the four components of the response chain, appropriate self-feeding, and problem behavior by dividing the total number of agreements by the number of agreements plus disagreements and multiplying by 100. For response chain components, agreements were trials where both data collectors scored the respective component as accurate responding, completed responding, prompted responding, or inaccurate or no responding. For appropriate self-feeding,

agreements were trials where both data collectors scored all response chain components as accurate responding. For problem behavior, agreements were trials where both data collectors scored problem behavior as occurring or not occurring. Mean IOA for response chain components was 99% (range, 93-100%) for Jefferson, 100% (range, 99-100%) for Mowgli, 100% (range, 98-100%) for Roy, 99% (range, 97-99%) for Josh, 96% (range, 88-100%) for Trevor, 99% (range, 96-100%) for Elliot, and 99% (range, 93-100%) for Antonia. Mean IOA for appropriate self-feeding was 99% (range, 93-100%) for Jefferson, 100% for Mowgli, 100% for Roy, 98% (range, 97-99%) for Josh, 91% (range, 90-94%) for Trevor, 100% (range, 98-100%) for Elliot, and 98% (range, 91-100%) for Antonia. Mean IOA for problem behavior was 99% (range, 97-100%) for Jefferson, 98% (range, 91-100%) for Mowgli, 90% (range, 87-92%) for Roy, 100% for Josh, 96% (range, 88-100%) for Trevor, 100% (range, 99-100%) for Elliot, and 99% (range, 95-100%) for Antonia. We calculated total-count IOA for inappropriate self-feeding and consumption by dividing the lower observed frequency (or amount for consumption) by the higher observed frequency (or amount for consumption) and multiplying by 100. Mean IOA for inappropriate self-feeding was 99% (range, 80-100%) for Jefferson, 98% (range, 94-100%) for Mowgli, 100% for Roy, 94% (range, 93-95%) for Josh, 91% (range, 90-94%) for Trevor, 99% (range, 96-100%) for Elliot, and 85% (range, 55-100%) for Antonia. Mean IOA for consumption was 100% for all participants. We calculated partial-agreement-within-trial IOA for expulsion by diving the lower observed frequency by the higher observed frequency for each trial and multiplying by 100, and then summing the total means of each trial and dividing by the total number of trials. Mean IOA for expulsion was 100% for Jefferson, Mowgli, Roy, Josh, and Trevor; 90% (range, 85-100%) for Elliot; and, 100% (range, 95-100%) for Antonia.

The same second independent data collector also collected procedural integrity data for all therapist behaviors during sessions in which he or she collected reliability data. Again, we analyzed self-feeding and component prompts as the percentage of trials of accurate completion. Mean integrity for self-feeding prompts was 100% for Jefferson, Josh, Trevor, and Elliot; 98% (range, 95-100%) for Mowgli and Antonia; and, 99% (range, 98-100%) for Roy. Mean integrity for component prompts was 100% for Jefferson and Mowgli, and 97% (range, 90-100%) for Elliot. Neither Roy, Josh, nor Trevor experienced conditions requiring prompting of the response chain components. We did not collect data on component prompts for Antonia. We analyzed response blocking as the percentage of opportunities. Mean integrity for response blocking was 100% (range, 98-100%) for Jefferson, 95% (range, 86-100%) for Mowgli, 96% for Roy, 95% for Josh, 94% (range, 92-95%) for Trevor, 100% (range, 97-100%) for Elliot, and 92% (range, 83-100%) for Antonia. We analyzed reinforcer delivery as the percentage of trials of correct implementation. Mean integrity for reinforcer delivery was 100% for Jefferson, Mowgli, Roy, and Josh; 99% (range, 96-100%) for Trevor. We did not collect data on reinforcer delivery for Elliot and Antonia.

Results and Discussion

Table 1 depicts overall results of our assessment and treatment of inappropriate self-feeding. Seven children participated in the current study. All seven participants completed the assessment. The assessment identified a skill deficit for four participants (Antonia, Elliot, Mowgli, and Roy), a motivation deficit for two participants (Trevor and Josh), and a potential interaction between a skill and a motivation deficit for one participant (Jefferson). All participants other than Roy continued through treatment. Backward chaining was successful for all three of the remaining participants for whom the assessment identified a skill deficit (Antonia,

Elliot, and Mowgli). Extended response blocking was successful for Josh whose assessment identified a motivation deficit. Extended response blocking was unsuccessful for Trevor, whose assessment also identified a motivation deficit, but response blocking with programmed DRA was successful in increasing responding to mastery levels. Because Jefferson's assessment identified a possible interaction between skill and motivation deficits, we treated Jefferson's potential motivation deficit first (this order of treatment is consistent with previous literature; Duhon et al., 2004; Lerman et al., 2004). Response blocking with programmed DRA was unsuccessful. We then targeted a skill deficit. Backward chaining was partially successful, but we encountered responding that continued to suggest a motivation deficit (e.g., moderate levels of accurate responding, engagement in potentially competing behaviors). A second attempt at addressing a potential motivation deficit was successful when we implemented extended response blocking. We expand on these results below. We do not present data on consumption or expulsion because all participants consumed adequate food and engaged in a near-zero level of expulsion during the study. Only one participant (Roy) engaged in problem behavior warranting the termination of session. We present only his problem behavior data.

Assessment

Figures 1 and 2 depict the results for our evaluation of response blocking as an assessment procedure to identify skill and motivation deficits. Graphing conventions remain the same across both graphs. Scaled to the x-axis are sessions. Scaled to the left y-axis is the percentage of opportunities of appropriate self-feeding (closed circles). Scaled to the right y-axis is the frequency of inappropriate self-feeding (grey bars). Figure 1 includes data for Elliot (first panel), Trevor (second panel), Antonia (third panel), and Mowgli (fourth panel).

Elliot engaged in a zero level of appropriate self-feeding across all conditions of the assessment. During baseline (Session 1-5), Elliot engaged in a moderate level of inappropriate self-feeding (range, 5-19; *M* = 10.60). He engaged in a lower level (range, 0-12; *M* = 4.50) during response blocking (Session 6-19). Reversals to baseline (Session 20-28; range, 0-27; *M* = 15.00) and response blocking (Session 29-32; range, 0-8; *M* = 4.00) replicated these effects. This pattern of responding suggested a skill deficit. Response blocking decreased inappropriate self-feeding but did not evoke appropriate self-feeding.

Trevor engaged in a moderate level of appropriate self-feeding (range, 40-85%; *M* = 60.00%) and an increasing trend of inappropriate self-feeding (range, 1-15; *M* = 6.00) during baseline (Session 1-5). Responding increased to mastery (i.e., a near-zero level of inappropriate self-feeding and a level of at least 80% of appropriate self-feeding for three consecutive sessions) during response blocking (Session 6-9). During the reversal to baseline (Session 10-18), we observed an increasing trend of inappropriate self-feeding and to frequencies double that of the initial baseline condition (range, 0-49; *M* = 14.17). We simultaneously observed variability in, and a slightly lower level of, appropriate self-feeding (range, 0-95%; *M* = 60.00%), with a drastic decrease in appropriate self-feeding corresponding with the steep increase in appropriate self-feeding during the last two sessions of this condition. During the reversal to response blocking (Session 19-30), Trevor engaged in a stable and moderate level of appropriate self-feeding (range, 15-85%; *M* = 48.33%) and a lower level of inappropriate self-feeding (range, 2-23; *M* = 7.17). This pattern of responding suggested a motivation deficit. Trevor engaged in both appropriate and inappropriate self-feeding. When inappropriate self-feeding resulted in response blocking, inappropriate self-feeding immediately decreased and the level of appropriate self-feeding increased. We were, however, unable to replicate the near-zero level of inappropriate

self-feeding during the second response blocking condition as we observed in the first. Although we implemented response blocking with overall high integrity (range, 92-95%; *M* = 94.00%), we may have adventitiously reinforced inappropriate self-feeding by not blocking every instance. Lerman & Iwata (1996) and Smith et al. (1999) discussed the response blocking functioning as punishment versus extinction. Trevor's data allude to response blocking exerting an extinction effect; a punishment effect would likely produce an immediate and sustained decrease in inappropriate self-feeding. We elaborate further on the underlying mechanism of response blocking in the general discussion section.

Antonia engaged in a near-zero level of appropriate self-feeding across all conditions of the assessment. During baseline (Session 1-9), Antonia engaged in a high level of inappropriate self-feeding (range, 0-43; *M* = 15.89). She engaged in a lower level (range, 0-35; *M* = 8.50) during response blocking (Session 10-17). Reversals to baseline (Session 18-22; range, 8-26; *M* = 19.00) and response blocking (Session 23-27; *M* = 0.00) replicated these effects. This pattern of responding suggested a skill deficit. Response blocking decreased inappropriate self-feeding but did not evoke appropriate self-feeding.

Mowgli engaged in a zero level of appropriate self-feeding across all conditions of the assessment. During baseline (Session 1-18), Mowgli engaged in a high level of inappropriate self-feeding (range, 0-58; *M* = 33.39). He engaged in a lower level (range, 0-31; *M* = 8.21) during response blocking (Session 19-32). Reversals to baseline (Session 33-41; range, 20-45; *M* = 31.67) and response blocking (Session 43-51; range, 0-14; *M* = 3.10) replicated these effects. This pattern of responding suggested a skill deficit. Response blocking decreased inappropriate self-feeding but did not evoke appropriate self-feeding.

Figure 2 includes data for Roy (first panel), Josh (second panel), and Jefferson (third panel). Roy engaged in a near-zero level of appropriate self-feeding across all conditions of the assessment. During baseline (Session 1-6), Roy engaged in a moderate level of inappropriate self-feeding (range, 1-38; *M* = 23.67). He engaged in a lower level (range, 0-9; *M* = 3.33) during response blocking (Session 7-12). Reversals to baseline (Session 13-15; range, 21-30; *M* = 26.33) and response blocking (Session 16-19; range, 0-1; *M* = 0.50) replicated these effects. This pattern of responding suggested a skill deficit. Response blocking decreased inappropriate self-feeding but did not evoke appropriate self-feeding.

Josh engaged in a high level of appropriate self-feeding (range, 5-95%; *M* = 70.50%) and a moderate level of inappropriate self-feeding (range, 4-20; *M* = 10.20) during baseline (Session 1-11). Responding increased met mastery criteria (i.e., a near-zero level of inappropriate self-feeding and a level of at least 80% of appropriate self-feeding for three consecutive sessions) during response blocking (Session 12-16). During the reversal to baseline (Session 17-19), we observed an increasing trend and a higher level of inappropriate self-feeding (range, 5-26; *M* = 14.00). We simultaneously observed a decreasing trend and slightly lower level of appropriate self-feeding, but this level was still above mastery (range, 75-90%; *M* = 81.67%). During the reversal to response blocking (Session 20-24), his responding again met mastery criteria almost immediately. This pattern of responding suggested a motivation deficit. Although appropriate self-feeding was high across all conditions, the level increased during response blocking and inappropriate self-feeding immediately decreased.

Jefferson engaged in near-zero level of appropriate self-feeding (range, 0-15%; *M* = 1.56%) and a high level of inappropriate self-feeding (range, 0-48; *M* = 31.94) during baseline (Session 1-16). Appropriate self-feeding immediately increased (range, 10-65%; *M* = 65%) and

inappropriate self-feeding immediately decreased (range, 0-11; *M* = 3.33) during response blocking (Session 17-22). Reversals to baseline (Session 23-28) and response blocking (Session 29-33) replicated these effects. We observed an immediate decreasing trend to a zero level of appropriate self-feeding (range, 0-35%; *M* = 10.83%) and an immediate increasing trend of inappropriate self-feeding (range 3-38; *M* = 21.67) during the reversal to baseline. We observed an increased but low level of appropriate self-feeding (range, 20-35%; *M* = 25.00%) and a low level of inappropriate self-feeding (range, 0-11; *M* = 4.00). This pattern of responding suggested a potential interaction between a skill and a motivation. Response blocking evoked appropriate self-feeding, but the level of appropriate self-feeding was low. Jefferson had acquired the skills to appropriately self-feed but may have required refining of these skills to do so accurately and efficiently.

Treatment

Two graphs depict the results for those participants whose assessment identified a skill deficit. One graph depicts accurate responding for response chain components and inappropriate self-feeding during backward chaining. Graphing conventions remain similar to the assessment with several exceptions: each panel depicts responding for a response chain component from the last component (i.e., take bite) in the first panel to the first component (i.e., pick up spoon) in the fourth panel, accurate responding is scaled to the y-axis (as opposed to appropriate self-feeding), red data points denote baseline probes, and grey sections denote the unavailability of accurate responding because of prescribed prompting during backward chaining. The other graph depicts appropriate and inappropriate self-feeding throughout assessment and treatment. Graphing conventions remain similar to the assessment with two exceptions: the top panel depicts responding during assessment and post-treatment while the bottom panel depicts responding

during backward chaining, and red data points denote baseline probes. A single graph depicts the results for those participants whose assessment identified a motivation deficit. Graphing conventions remain the same as the assessment.

Antonia's assessment identified a skill deficit. We prescribed backward chaining as a teaching procedure to increase appropriate self-feeding and continued response blocking to maintain a low level of inappropriate self-feeding. Figure 3 depicts Antonia's accurate responding and inappropriate self-feeding during backward chaining (Session 28-112). Inappropriate self-feeding remained low throughout backward chaining (range, 0-4; $M = 0.94$). When we targeted the final component of the response chain (i.e., independent, accurate responding permitted for take bite; Session 32-41), responding remained above mastery (range, 80-100%; $M = 94.38\%$), even following a break from sessions. Two baseline probes, however, resulted in a low and a moderate level of accurate responding, respectively. This pattern of responding suggested the continued need for backward chaining to teach the component skills of appropriate self-feeding. We then targeted the third component of the response chain (i.e., independent, accurate responding permitted for spoon to mouth and take bite; Session 42-53). Accurate responding remained at a near-100% level for take bite and met mastery for spoon to mouth with little variability (range, 60-100%; $M = 88.18\%$). Although the third baseline probe resulted in a high level of accurate responding across all components, appropriate self-feeding was lower than the 80% criteria (see Figure 4), warranting the continuation of backward chaining. Next, we targeted the second component of the response chain (i.e., independent, accurate responding permitted for scoop food, spoon to mouth, and take bite; Session 54-81). Accurate responding for both take bite and spoon to mouth remained near 100%. Accurate responding for scoop food was variable and at a moderate level (range, 10-11%; $M = 63.25\%$)

before the fourth baseline probe – the first probe in the scoop food phase. Therapists reported variability in responding may have been due to the appropriateness (e.g., texture, bolus size) of using a spoon to consume some foods. During the baseline probe and thereafter, we ensured that we made all food "scoopable" (i.e., crushed or cut into small pieces) if needed. Responding during the probe continued to suggest the need for response blocking. During the continuation of the scoop-food phase, accurate responding was at a high level (range, 37-100%; *M* = 90.43%). However, again, a baseline probe resulted in a less-than-mastery level of responding. We then targeted the first component of the response chain (i.e., independent, accurate responding permitted for all components – pick up spoon, scoop food, spoon to mouth, and take bite; Session 82-112). Accurate responding remained at a near-100% level for take bite, spoon to mouth, and scoop food. Accurate responding for pick up spoon was highly variable (range, 10-100%; *M* = 79.52%) and only stabilized at a mastery level following the sixth baseline probe – the first during the pick-up-spoon phase (range 45-100%; *M* = 86.88%). Nonetheless, the final two baseline probes resulted in less-than-mastery responding. Although Antonia's overall levels of responding during baseline probes suggested the ongoing need for backward chaining to continue, we recognized that a 5-s ITI and no clean-mouth check allowed us to proceed to a subsequent trial prior to Antonia consuming the bite from the previous trial. This may have created an abolishing operation decreasing the likelihood of self-feeding and diminishing the efficacy of food from a new bite as a reinforcer. We, therefore, implemented a baseline condition with a 15-s ITI and a clean-mouth check following the final baseline probe (see Figure 4).

Figures 4 depicts Antonia's appropriate and inappropriate self-feeding across all condition of the study. Antonia engaged in a near-zero level of appropriate self-feeding across baseline and response blocking conditions during the assessment. She also engaged in a

moderate level of inappropriate self-feeding during baseline, which decreased to a near-zero level during response blocking of the assessment. Antonia continued to engage in a near-zero level of inappropriate self-feeding (range, 0-4; $M = 0.94$) during backward chaining (Session 28-112). Appropriate self-feeding during baseline probes resulted in variable responding (range, 20-79%). Note that for participants other than Antonia and Elliot, we would have continued under baseline contingencies if self-feeding met at least 75% of the mastery criteria (i.e., near-zero level of inappropriate self-feeding and 60% of opportunities with appropriate self-feeding). These criteria, however, were not in place for Antonia, and, therefore, her variable appropriate self-feeding during baseline probes suggested the continued need for backward chaining. During the pick-up-spoon phase of backward chaining, we recognized that a 5-s ITI may have been too brief of a period for Antonia to consume food. No clean-mouth check also allowed for the next trial to begin without Antonia consuming her previous bite presenting a potential abolishing operation. We conducted one final baseline probe under the current conditions before we continued with baseline contingencies but implemented a 15-s ITI and clean-mouth checks (Session 113-119). Antonia's responding immediately met mastery with these procedural changes. These data suggest two findings. One, Antonia had acquired the skills to appropriately self-feed and do so in the absence of inappropriate self-feeding, validating the skill deficit identified during the assessment. Two, our initial procedures and data-collection methods may not have been sensitive to identify Antonia's true responding levels. Although the addition of a 15-s ITI and clean-mouth check may have addressed this limitation, we did not systematically evaluate the effects of this change, so drawing conclusions other than Antonia had acquired the skills to appropriately self-feed are preliminary. Antonia's data suggest that the matched treatment validated a skill deficit identified by the assessment.

Elliot's assessment identified a skill deficit. We prescribed backward chaining as a teaching procedure to increase appropriate self-feeding and continued response blocking to maintain a low level of inappropriate self-feeding. Figure 5 depicts Elliot's accurate responding and inappropriate self-feeding during backward chaining (Session 33-127). Inappropriate self-feeding remained low throughout backward chaining (range, 0-3; $M = 0.13$). The first baseline probe immediately following physical guidance resulted in a zero level of appropriate self-feeding, suggesting the continued need for backward chaining. When we targeted the final component of the response chain (i.e., independent, accurate responding permitted for take bite; Session 38-44), responding remained above mastery (range, 80-100%; $M = 92.57\%$). A baseline probe resulted in appropriate self-feeding at 65% of opportunities. Note that for all other participants other than Antonia and Elliot, we would have continued under baseline contingencies if self-feeding met at least 75% of the mastery criteria (i.e., near-zero level of inappropriate self-feeding and 60% of opportunities with appropriate self-feeding). These criteria, however, were not in place for Elliot, and, therefore, appropriate self-feeding did not meet the 80% mastery criteria. Responding below 80% of opportunities suggested the continued need for backward chaining. We then targeted the third component of the response chain (i.e., independent, accurate responding permitted for spoon to mouth and take bite; Session 46-69). Accurate responding continued at a level above mastery for take bite. We also observed a decreasing trend of accurate responding for spoon to mouth. Elliot continued to turn his wrist as he brought the spoon to his mouth, which resulted in food falling off the spoon. We implemented most-to-least prompt fading to further teach Elliot, under more controlled guidance, to accurately bring his spoon to his mouth (Session 57-66). Responding during prompt fading was near-100% and was above 95% for three consecutive sessions following our removal of these additional

prompts. Responding during a subsequent baseline probe was high but not above 80% of opportunities. Next, we targeted the second component of the response chain (i.e., independent, accurate responding permitted for scoop food, spoon to mouth, and take bite; Session 71-74). Accurate responding for both take bite and spoon to mouth were near 100%. Accurate responding for scoop food reached mastery in four sessions. Responding was again high but not at mastery during the following baseline probe. We then targeted the first component of the response chain (i.e., independent, accurate responding permitted for all components – pick up spoon, scoop food, spoon to mouth, and take bite; Session 76-101). Accurate responding remained at a near-100% level for take bite and, although more variable, remained above mastery for almost all sessions for spoon to mouth (range, 65-100%; *M* = 91.00%). Responding for pick up spoon (range, 42-100%; *M* = 84.69%) and scoop food (range, 42-100%; *M* = 79.50%) was variable. The subsequent baseline probe, however, resulted in an above-mastery level of responding. We continued under baseline contingencies (see Figure 6) but failed to observe a maintained mastery-level responding following an extended period away from sessions (break in x-axis). Upon a reversal to pick up spoon (Session 115-127), we observed an immediate high level of responding across all four components of the response chain and an above-mastery level of responding during a final baseline probe. This pattern of responding suggested that Elliot had mastered the skills to appropriately self-feed in the presence of response blocking for inappropriate self-feeding.

Figure 6 depicts Elliot's appropriate and inappropriate self-feeding across all condition of the study. Elliot engaged in a zero level of appropriate self-feeding across baseline and response blocking conditions during the assessment. He also engaged in a moderate level of inappropriate self-feeding during baseline, which decreased to a lower level during response blocking of the

assessment. Elliot continued to engage in a near-zero level of inappropriate self-feeding (range, 0-3; $M = 0.13$) during backward chaining (Session 33-127). Appropriate self-feeding during baseline probes resulted in variable responding (range, 0-90%). Note that for participants other than Antonia and Elliot, we would have continued under baseline contingencies if self-feeding met at least 75% of the mastery criteria (i.e., near-zero level of inappropriate self-feeding and 60% of opportunities with appropriate self-feeding). These criteria, however, were not in place for Elliot, and, therefore, his variable appropriate self-feeding during baseline probes suggested the continued need for backward chaining. During the reversal to baseline (Session 103-114), responding maintained at mastery during until a period away from sessions. Upon return, Elliot engaged in a zero level of appropriate self-feeding and a high level of inappropriate self-feeding. We reversed to target the first component of the response chain. The first baseline probe in this phase resulted in a moderate level of appropriate self-feeding but the second probe resulted in 90% appropriate self-feeding. A reversal to baseline resulted in maintained mastery responding. These data suggest that Elliot acquired the skills to appropriately self-feed and do so in the absence of inappropriate self-feeding, validating the skill deficit identified during the assessment. One limitation is that the unequal durations of the two baseline conditions following treatment. Whether we would replicate the decrease in appropriate and an increase in inappropriate self-feeding over time in the final baseline condition is unknown.

Figure 7 depicts Mowgli's appropriate and inappropriate self-feeding across the study. Mowgli's assessment suggested a skill deficit. Mowgli engaged in a zero level of appropriate self-feeding across all baseline and response blocking conditions during the assessment. Inappropriate self-feeding was at a high level during baseline and decreased to a near-zero level during response blocking of the assessment. We prescribed backward chaining to maintain a low

level of inappropriate self-feeding while teaching Mowgli the skills to appropriately self-feed. Following the physical guidance phase of backward chaining, Mowgli's responding reached the 75%-criteria to continue under baseline contingencies (i.e., near-zero level of inappropriate self-feeding and at least 60% of opportunities with appropriate self-feeding). During a reversal to baseline, Mowgli continued to engage in a mastery level of responding. These data suggest that we did not need to continue backward chaining procedures. Physical guidance was sufficient to teach the component skills of appropriate self-feeding. Maintained mastery responding under baseline contingencies validated the skill deficit identified by the assessment.

Jefferson's assessment identified a potential interaction between a skill and a motivation deficit. Figure 8 depicts Jefferson's appropriate and inappropriate self-feeding across all conditions of the study. Jefferson engaged in a near-zero level of appropriate self-feeding with a high level of inappropriate self-feeding during baseline of the assessment. Appropriate self-feeding increased to a moderate level and inappropriate self-feeding immediately decreased to a near-zero level during response blocking of the assessment. We first implemented response blocking with programmed DRA (Session 34-37) to address a motivation deficit because response blocking alone did not evoke a near-mastery level of responding. Although inappropriate self-feeding maintained at a near-zero level, appropriate self-feeding continued at a low to moderate level (range, 10-40%; M = 25.00%). Programmed DRA was ineffective at increasing appropriate self-feeding. We reversed to baseline (Session 38-46) to replicate previous levels of responding. Baseline resulted in an increase of inappropriate self-feeding but to a level lower than the previous two baseline conditions (range, 0-19; M = 8.44). Baseline also resulted in a slightly lower level of appropriate self-feeding but a level greater than previous baseline conditions (range, 5-35%; M = 16.67%). We prescribed backward chaining (Session 47-87) to

address a skill deficit given our initial treatment for a motivation deficit was unsuccessful. Jefferson's inappropriate self-feeding remained at a near-zero level throughout backward chaining. Appropriate self-feeding during baseline probes increased but to only low to moderate levels. Further, anecdotal reports of unmeasured behavior (e.g., laughing, vocal stereotypy) and Jefferson's level of accurate responding during backward chaining continued to suggest a motivation deficit (see Figure 9). We, therefore, reversed to baseline (Session 88-90), which resulted in a replicated moderate level of inappropriate self-feeding (range, 23-38; *M* = 29.67) and a near-zero level of appropriate self-feeding (range, 0-15%; *M* = 6.67%). We then implemented response blocking alone (Session 91-106). We implemented response blocking alone to replicate the effects observed during the assessment. Inappropriate self-feeding immediately decreased to a near-zero level (range, 0-12; *M* = 1.43). Appropriate self-feeding immediately increased (range, 0-85%; *M* = 48.13%) and, although variable, continued on an increasing trend until Jefferson left the center. Jefferson appropriately self-fed for 70%, 70%, and 85% of opportunities, with no instances of inappropriate self-feeding, during his final three sessions, respectively. These data suggest the possibility that response blocking alone may have increase responding to a mastery level. His departure from the clinic, however, resulted in an abrupt stop to sessions and the inability for us to conclusively validate assessment results by observing mastery levels of appropriate and inappropriate self-feeding. Nonetheless, the increasing trend of appropriate self-feeding during response blocking post-backward chaining suggests that we have adequately addressed a skill deficit with backward chaining, and, subsequently, continued response blocking served as an adequate treatment for a motivation deficit.

Figure 9 depicts Jefferson's accurate responding and inappropriate self-feeding during backward chaining (Session 47-87). Inappropriate self-feeding maintained at a near-zero level (range, 0-2; *M* = 0.19). We concluded the physical guidance phase with two baseline probes. The first resulted in high levels of accurate responding across all four response chain components warranting the continuation of baseline contingencies. The second probe, however, resulted in a lower level of accurate responding and overall appropriate self-feeding. We then targeted the final component of the response chain (i.e., independent, accurate responding permitted for take bite; Session 54-56). Accurate responding immediately reached mastery, but a subsequent baseline probe resulted in a low level of accurate responding and appropriate self-feeding. We also observed this pattern of responding when we targeted the third component of the response chain (i.e., independent, accurate responding permitted for spoon to mouth and take bite; Session 58-60). Accurate responding for take bite remained above mastery. We then targeted the second component of the response chain (i.e., independent, accurate responding permitted for scoop food, spoon to mouth, and take bite; Session 62-87). Accurate responding for take bite and spoon to mouth maintained above mastery. Accurate responding for scoop food, however, was variable but at a moderate to high level (Session 62-69; range, 45-90%; *M* = 67.50%). Therapists anecdotally reported that Jefferson engaged in competing behaviors not defined as problem behavior (e.g., playing with food in the bowl, laughing throughout sessions, continuously repeating therapist's vocal instruction to "take a bite") and he rarely engaged with the programmed reinforcer. Although we delivered a different programmed reinforcer during backward chaining than we did during response blocking with DRA, these anecdotal reports in addition to Jefferson's responding suggested a conceptual flaw in our procedures: Jefferson could have engaged in responding that resulted in access to food but did not result in access to

the programmed reinforcer. For example, when we targeted scoop food during backward chaining, the therapist physically and vocally prompted Jefferson to scoop his food if he did not do so within 5 s of the prescribed prompt to pick up his spoon. The therapist, however, then allow independent and accurate responding for the latter two components of the response chain. The need for additional prompting would have voided delivery of the programmed reinforcer but would have allowed access to the primary reinforcer of food. Food was the more immediate, and likely the more potent, reinforcer. Access to food may have decreased the potential, if any, reinforcing value of the programmed stimulus. These data further suggested the influence of a motivation deficit.

We implemented a response cost (Session 71-77) within the scoop-food phase of backward chaining to address this potential procedural limitation. Jefferson only received food (and the programmed reinforcer) for accurate responding for all available component behaviors; inappropriate or no responding resulted in termination of the trial rather than physical and vocal prompting for that component behavior. Response cost resulted in a similar pattern of both measured and unmeasured responding. Inappropriate self-feeding continued at a zero level and appropriate self-feeding continued at a moderate level (range, 59-70%; M = 60.71%). Unmeasured responding (e.g., continued laughing and vocally and continuously restating therapist prompts throughout session) persisted. Because Jefferson continued to repeat what the therapist said within session, we hypothesized that access to vocal attention may be reinforcing. We, therefore, manipulated attention as a potential reinforcer in addition to the response cost (Session 78-83), but this resulted in a decreased level of accurate responding (range, 10-45%; M = 25.83%). We reversed to response blocking alone (Session 84-86) to replicate the moderate level of appropriate self-feeding we previously observed. Accurate self-feeding, however,

maintained at a low level (range 15-25%, *M* = 15.00%). This pattern of responding continued during a probe to the standard scoop-food phase. Jefferson's last day at the clinic was abrupt. We reversed to baseline and then implemented response blocking alone to follow our written procedures and to re-address a potential motivation deficit with the limited time we had remaining with Jefferson. Overall, Jefferson's responding during intervention suggest his responding was a function of both a skill and motivation deficit. We are limited in our interpretation of these results as we were unable to increase accurate responding (and appropriate self-feeding) to a consistent, mastery level.

Figure 10 depicts Trevor's responding across the study. Trevor's assessment suggested a motivation deficit. Inappropriate self-feeding increased to a moderate level during initial baseline and a high level during the reversal to baseline for the assessment. Inappropriate self-feeding decreased to a near-zero level during response blocking but only decreased to a low to moderate level during the reversal to response blocking of the assessment. Appropriate self-feeding was at a moderate level during baseline and increased to mastery following response blocking during the assessment. A reversal to baseline, however, resulted in an initial high but more variable level of appropriate self-feeding before appropriate self-feeding decreased to near-zero. This drastic decrease in appropriate self-feed coincided with the drastic increase in inappropriate self-feeding. During the reversal to response blocking, appropriate self-feeding gradually increased but did not reach the mastery level observed in the previous response blocking condition. We should have implemented DRA at this point according to our treatment criteria for a motivation deficit, but we continued with extended response blocking (Session 31-44). Although we observed an increased level of appropriate self-feeding (range, 55-100%; *M* = 73.93%), this level still did not meet mastery. We, therefore, supplemented response blowing with programmed

DRA (Session 45-49). Inappropriate self-feeding persisted at a low level during response blocking with programmed DRA (range 1-5; *M* = 2.20). Appropriate self-feeding increased to a level above mastery (range, 70-100%; *M* = 86.00%). These data suggest that Trevor required programmed DRA to increase responding to mastery. These results validate the motivation deficit identified during the assessment. One limitation is the length of extended response blocking (13 sessions) compared to response blocking with programmed DRA (5 sessions). Whether Trevor's mastery responding would have maintained over time is unknown. Trevor left his service provider before we were able to conduct further sessions.

Figure 11 depicts Josh's responding across all the study. Josh's assessment suggested a motivation deficit. Inappropriate self-feeding was at a moderate level during baseline and immediately decreased to a near-zero level during response blocking of the assessment. Appropriate self-feeding was at a high level across baseline and response blocking, but appropriate self-feeding was less variable and at a higher level (i.e., consistently above mastery) during response blocking of the assessment. We prescribed extended response blocking (Session 25-34) as treatment to maintain Josh's mastery levels of responding. Josh engaged in a zero level of inappropriate self-feeding and a high level of appropriate self-feeding (range, 80-100%; *M* = 97.50%) during treatment. These data suggest that response blocking alone was sufficient to maintain appropriate self-feeding in the absence of inappropriate self-feeding and validates the motivation deficit identified during the assessment. We also observed these effects across two 1-month periods away from sessions. However, clinically, Josh already engaged in a high level of appropriate self-feeding. Although our procedure decreased inappropriate self-feeding, we may have observed a ceiling effect regarding the potential concomitant effect of response blocking on appropriate self-feeding.

Concomitant Effect of Response Blocking: Increased Problem Behavior

Figure 12 depicts the concomitant effects of response blocking on problem behavior for Roy. Graphing conventions remain the same as the assessment with the exception that scaled to the y-axis is the percentage of trials of problem behavior. Roy was the only participant who engaged in problem behavior meeting the session-termination criteria. He is also the only participant for whom response blocking affected problem behavior. Problem behavior was at a near-zero level during baseline and increased to an average of 32.50% of trials during response blocking. Problem behavior immediately decreased to near zero during the reversal to baseline. A reversal to response blocking replicated an increased level of problem behavior to an average of 51.25% of trials. This pattern of responding suggest that an increase in problem behavior corresponded with the implementation of response blocking.

General Discussion

Researchers have mostly evaluated assessment and treatment for topographies of pediatric feeding disorders (e.g., food refusal, food selectivity, inappropriate mealtime behavior) that produce more immediate and severe health problems (e.g., failure to thrive). There are few empirical evaluations of topographies (e.g., inappropriate self-feeding) producing delayed effects despite evidence that these effects may worsen if left untreated, particularly for atypically developing children and those with certain health predispositions (Kerwin & Eicher, 2004; Piazza & Addison, 2007; Shore & Piazza, 1997; Schreck et al., 2004; Stimbert et al., 1977). We implemented a proactive approach to attenuate the potential emergence, persistence, and worsening of negative outcomes produced by inappropriate self-feeding for seven children. Our current study replicates and extend the literature in several ways.

Our assessment replicated and extended O'Brien, Bugle, and Azrin (1972). We evaluated the effects of response blocking as an assessment procedure to identify skill and motivation deficits for inappropriate self-feeding. During baseline, appropriate and inappropriate self-feeding resulted in no programmed consequences. During response blocking, inappropriate self-feeding resulted in blocking and appropriate self-feeding continued to result in no programmed consequences. Response blocking reduced inappropriate self-feeding to a low level for all participants and these effects were immediate for most participants. We identified skill and motivation deficits based on the potential concomitant, evocative effect of response blocking on appropriate self-feeding. The assessment indicated a skill deficit if appropriate self-feeding remained low during response blocking. The assessment indicated a motivation deficit if response blocking evoked appropriate self-feeding or increased the level of appropriate self-feeding. The assessment resulted in clear effects for six of the seven participants. We identified a skill deficit for four participants, a motivation deficit for two participants, and a potential interaction between a skill and a motivation deficit for one participant. These results replicate and expand those of O'Brien, Bugle, and Azrin (1972). O'Brien, Bugle, and Azrin identified a skill deficit for one participant using response blocking as an assessment procedure. O'Brien, Bugle, and Azrin, however, conducted a case study, evaluated the effects of response blocking using an A-B-A reversal design, and only reported direct measures of appropriate self-feeding (they anecdotally reported measures of inappropriate self-feeding). We included seven participants during the assessment, evaluated the effects of response blocking using a multiple baseline across participants design with embedded reversals, and reported direct measures of both appropriate and inappropriate self-feeding. These methodological extensions increase experimental control through inter and intrasubject replication (Sidman, 1960) increasing

confidence in the use of response blocking to identify skill and motivation deficits. Our use of response blocking also expands the literature in several ways.

The use of response blocking as an assessment procedure offers a unique approach to evaluating of skill and motivation deficits. Most researcher have evaluated skill and motivation deficits for academic performance and language fluency (e.g., Daly et al., 2006; Duhon et al., 2004; Eckert et al., 2000, 2002; Lerman et al., 2004; Noell et al., 1998, 2000, 2001). These assessments generally include a baseline condition from which researchers compared responding during a test or multiple test conditions. Test conditions for a motivation deficit included pre-session instructions (e.g., description of contingencies, "if-than" statements, rules) and additional reinforcers contingent on correct responding. Test conditions for a skill deficit included additional prompting (e.g., modeling, physical guidance, time delay) and pre-session trainings. There are two related, potential limitations to these procedures if applied to self-feeding. One, participants in previous studies were mostly typically developing (e.g., Daly et al., 1998; Noell et al., 2001; VanAuken et al., 2002) or were receiving special services but had verbal repertoires extensive enough to understand the contingency descriptions delivered before test sessions for a motivation deficit (e.g., Daly et al., 2006; Özmen & Atbaşi, 2016). Anecdotally, our participants had the fine-motor dexterity to self-feed using a spoon, but most (i.e., Antonia, Elliot, Jefferson, and Mowgli) lacked an extensive verbal repertoire. The putative discriminative stimulus of the pre-session instructions, as used in previous studies, would likely be ineffective for these participants. Behavior change would then only increase if the participant's behavior contacted the DRA contingency. Their near-zero levels of appropriate self-feeding limit the likelihood that behavior would contact reinforcement. Ineffective environmental manipulations to assess a motivation deficit could have resulted in a false-negative identification for a motivation deficit

and a false-positive identification for a skill deficit. The results of Lerman et al. (2004) somewhat support this effect. Reinforcement alone did not increase responding for any of the participants who engaged in near-zero levels of responding during initial baseline. The researchers, however, followed their brief motivation assessment with a brief skill assessment, which objectively identified a skill deficit. Two, previous researchers measured correct and incorrect (or the absence of) responses (e.g., vocalizing one's name vs. not vocalizing one's name; correctly vs. incorrectly completing math questions). These behaviors are incompatible – an increase in correct responding naturally results a decrease in incorrect responding. Inappropriate and appropriate self-feeding, however, are not. Inappropriate and appropriate self-feeding are also in the same response class (i.e., functionally similar in that they both result in access to the reinforcer of food). The relationship between both self-feeding responses adds a level of complexity requiring attention, and whether the procedures of previous studies can adequately evaluate self-feeding is an empirical question. Although we did not directly address this question, we did offer alternative assessment procedures that address the complexity of self-feeding. Rather than address a potential motivation deficit with a putative discriminative stimulus (e.g., contingency statement) and differential reinforcement, we capitalized on establishing operations (i.e., an environmental event or stimulus that increasing the reinforcing efficacy of a consequence and increases responding to obtain that reinforcer [Laraway et al., 2003; Michael, 1982]). Blocking decreased access to the reinforcer of food for inappropriate self-feeding, increasing a sense of deprivation from food, and, therefore, increasing the likelihood appropriate self-feeding would occur to obtain food. An increase in appropriate self-feeding would suggest a motivation deficit. Conceptually, the effect of the establishing operation

generalizes across all participants. Whether appropriate self-feeding increases as a collateral effect of response blocking identified skill and motivation deficits.

Evaluating the direct and indirect effect of response blocking on inappropriate and appropriate self-feeding, respectively, furthers the literature regarding response allocation across a class of functionally similar behaviors (e.g., Green & Striefel, 1988; Hanley, Iwata, Roscoe, et al., 2003; Hanley et al., 2000; Rapp et al., 2004). Response blocking evokes increases (Hagopian & Adelinis, 2001; Lerman et al., 2003; Sprague & Horner, 1992; Wright & Vollmer, 2002) and decreases (Hanley et al., 2000; Rapp et al., 2004) in nontargeted problem behavior. Rapp and colleagues (2004) conducted a three-experiment study analyzing the effects of response blocking as an assessment procedure identifying a probabilistic hierarchy of behaviors (Study 1), and then systematically evaluating common treatment procedures for automatically maintained behavior (Studies 2 and 3). In Study 1, the researchers enrolled four children, aged 5-14 years and diagnosed with IDD, with stereotypy maintained by automatic reinforcement (determined via a previous FA). Rapp et al. evaluated the effects of response blocking the highest probable topography of stereotypy using a reversal design. Baseline consisted of 10-min sessions like those of the alone or no interaction conditions of a functional analysis (i.e., no programmed consequences for stereotypy). The initial baseline condition allowed the researchers to rank durations of various topographies of stereotypy to establish a probability hierarchy. The researchers identified the highest probable topography of stereotypy as the single response that occurred at the highest percentage of session for two consecutive sessions. Response blocking sessions were similar to baseline with the exception that the researchers now blocked the highest probable form of stereotypy. Response blocking decreased the targeted behavior during, and only during, the response blocking condition for every participant. Response blocking, however, also

had concomitant effects for three of four participants. Response blocking evoked some and decreased other non-targeted topographies of stereotypy. Rapp and colleagues suggested that collateral effects may often occur for responses within the same response class as the targeted response, and they suggest the utility of using response blocking to objectively determine allocation of responding across these behaviors. Evaluating the concomitant effects of response blocking in the context of self-feeding may help identify increases in more severe problem behavior as well as increases in more appropriate behavior. Our assessment resulted in both. We observed an increase in problem behavior corresponding with response blocking for one of seven participants (Roy). We also observed an increase in appropriate self-feeding for three participants (Jefferson, Trevor, and Josh). We addressed whether persistent engagement in inappropriate self-feeding was due to a skill or motivation deficit by analyzing this shift, or no shift, in response allocation. Clinicians may benefit from replicating our procedures. Further evaluating the effects of response blocking across a response class in general may promote more efficacious and generalizable interventions.

Our use of response blocking as an assessment procedure also shows generality of the brief assessment methodology to identify skill and motivation deficits. Duhon et al. (2004) identified skill and motivation deficits through single baseline and test-condition probes. Lerman et al.'s (2004) assessment ranged between 13 and 31 sessions. If not for their multiple baseline design, they may have been able to abbreviate the number of assessment sessions without compromising results. We identified skill and motivation deficits in 19 to 51 assessment sessions. Like Lerman et al. (2004), our length of assessment was somewhat arbitrary as we extended baselines and continued conducting sessions beyond observing effects for the purposes of experimental control and our multiple baseline design. How efficiently response blocking can

identify these deficits remains an empirical question, but whether the underlying mechanism of response blocking is punishment or extinction may dictate how brief the assessment may be. Lerman and Iwata (1996) and Smith and colleagues (1999) assessed the effects of response blocking on automatically maintained behavior by systematically manipulating the proportion of responses blocked. They identified a punishing effect when responding immediately decreased following response blocking and these effects maintained during schedule manipulations. They identified an extinction effect when responding gradually decreased during response blocking, maintained (or increased) during schedule thinning (a product of intermittent reinforcement), and eventually diminishing as the researcher's blocked a greater proportion of responses. Each study included one participant in their evaluation. Lerman and Iwata (1996) identifying a punishment effects and Smith and colleagues (1999) identifying an extinction effect. Our data only allude to the controlling mechanism of response blocking. Response blocking decreased inappropriate self-feeding across all participants in the current study. We observed an immediate decrease and a sustained low level for five participants (Jefferson, Josh, Roy, Mowgli, and Antonia), suggesting a punishment effect, and a gradual decreased for two participants (Trevor and Elliot), suggesting an extinction effect. Directly manipulating the schedule of blocking to evaluate the function of response blocking was beyond the scope of this study, but future experimental questions may find doing so advantageous. Identifying the underlying mechanism of response blocking may also indicate the response effort required to maintain effects. McCord and colleagues (2005) suggested response blocking requires near-perfect implementation to be effective, but this may only apply if the underlying mechanism is extinction (Lerman & Iwata, 1996; Smith et al., 1999). We reported overall high levels of procedural fidelity for response blocking across all participants (range, 83-100%). This decreased the likelihood of adventitious

reinforcement and potentially why we observed low levels of inappropriate self-feeding across all participants when we implemented response blocking. A direct measure of the controlling variable of response blocking, nonetheless, may help better establish the most efficacious treatment procedure to both mitigate potential resurgence of inappropriate self-feeding (for more on resurgence, see Greer and Shahan [2019], Lattal and St. Peter Pipkin [2009], Lieving et al. [2004], and Rachlin [1966]) and address the immediately presented issue.

We addressed the immediately presented issue of persistent inappropriate self-feeding by differentially prescribing interventions matched to the deficit identified during the assessment. These procedures served to validate assessment results, as well as increase appropriate and decrease inappropriate self-feeding. The matched treatment for a skill deficit included backward chaining to teach the appropriate chain of behaviors toward appropriate self-feeding and response blocking to maintain a low level of inappropriate self-feeding. Backward chaining with response blocking and programmed DRA increased appropriate and decreased inappropriate self-feeding for the three participants who completed treatment whose assessment identified a skill deficit. Additionally, the use of a multiple baseline design across components to evaluate the effects of response blocking controlled for maturation as a potential confounding variable (Sidman, 1960). Backward chaining procedures required more sessions to conduct than either treatment for a motivation deficit. The total number of backward chaining sessions ranged from 84 to 94 when we completed the procedures in full. Across both interventions for a motivation deficit, sessions ranged from 10 to 20. Controlling for maturation is pivotal in the assessment and treatment of a behavior often considered transient (Benjasuwantep et al., 2013; Manikam & Perman, 2000; Stimbert et al., 1977). One limitation to our treatment for a skill deficit was the use of programmed reinforcement for accurate responding. We included programmed DRA

because engagement in the final component of the response chain (i.e., take bite) resulted in access to food whether or not responding was accurate for this component or earlier components. For example, if we targeted spoon to mouth, the therapist physically and vocally prompted the first two components of the response chain (i.e., pick up spoon and scoop food) and allowed accurate responding for spoon to mouth and take bite. Inaccurate responding on either of these components for which accurate responding was available resulted in physical and vocal prompting for that component only. Access to food, therefore, was unaffected by responding. Our intent was to reinforce accurate responding for the available response chain in whole by delivering the programmed reinforcer, especially given these skills were being taught. We may, however, have simultaneously addressed a skill and a motivation deficit by including the delivery of a programmed reinforcer, which would limit (a) the extent to which our backward chaining procedures were in fact matched to the deficit, and (b) our ability to undoubtedly suggest we validated this deficit. Future research may omit the use of programmed DRA unless responding suggests its need. Future research may also evaluate the relative effect of the programmed reinforcer by conducting conditions with and without its delivery. The matched treatments for a motivation deficit included continued response blocking with and without programmed DRA. We implemented continued response blocking if it evoked and maintained a high level of appropriate and low level of inappropriate self-feeding during the assessment. We observed this pattern of responding for the first participant whose assessment identified a motivation deficit (Josh). Extended response blocking maintained mastery-level responding. We supplemented response blocking with programmed DRA if continued response blocking alone did not evoke appropriate self-feeding during the assessment or maintain mastery-level responding following extended exposure. We observed this pattern of responding for the second

participant whose assessment identified a motivation deficit (Trevor). Response blocking with programmed DRA increased responding to mastery levels. Results for Jefferson, whose assessment suggested both a skill and motivation deficit, were slightly less conclusive but did confirm the likelihood that both a skill and a motivation deficit affected behavior. Overall, the matched treatments validated our assessment results. These findings correspond to those in the literature on validating brief skill and motivation assessments (e.g., Duhon et al., 2004; Eckert et al., 2000; Lerman et al., 2004). There are numerous avenues for extending research on brief assessments, evaluating parameters of response blocking as an effective assessment and treatment procedure, and inappropriate self-feeding.

Future research can comprehensively validate brief assessment results by including both matched and unmatched treatments. VanAuken and colleagues (2002) conducted a brief assessment to identify components of a most-effective intervention for increasing the reading fluency of three school-age children. The researchers hypothesized that low fluency was a skill deficit, and, therefore, the brief assessment included baseline and three hierarchical test conditions: repeated readings (RR), listening passage preview and repeated readings (LPP/RR), and lowering the difficulty of the LPP intervention (EM/LPP/RR). The assessment identified the combined EM/LPP/RR intervention to be most effective for all participants. The assessment also identified LPP/RR to be least effective for two participants and RR to be least effective for one participant. The researchers validated assessment results my implementing both the most and least effective intervention identified by the assessment in an alternating treatments design. The most effective intervention initially produced higher rates of correctly read words than the least effective intervention for all participants. Differential responding during the treatment evaluation, however, decreased as sessions continued. Despite several limitations (e.g., potential

carryover effects during alternating treatment design, no evaluation of individualized effects during treatment), these results suggesting that the brief assessment identified the most effective treatment for immediate effects, but clinicians may be able to implement less time- and resource-dependent procedures to obtain similar rates of responding over time. Duhon et al. (2004) conducted a brief assessment to identify skill and motivation deficits for four children's performance on various academic tasks. The assessment test condition included pre-session contingency statements and differential reinforcement evaluated a potential motivation deficit. An increase in correct responding indicated a motivation deficit; a continued low level of correct responding indicated a skill deficit. To validate assessment outcomes, the researchers implemented both indicated and contraindicated interventions regardless of assessment results in an alternating treatments design. Prompting and pre-session training was the indicated treatment for a skill deficit and pre-session contingency statements and differential reinforcement was the indicated treatment for a motivation deficit. Only the matched treatment was successful at increasing correct responding for all participants. Implementing both indicated and contraindicated interventions further validated the brief assessment results. We only implemented matched treatments to validate our assessment for the sake of time, resources, and clinical significance. Additional treatment sessions, particularly those ineffective but implemented for the purpose of research, would have detracted from the participant's time spent receiving early intervention services and additional learning opportunities with peers present. We also did not have the resources required to conduct an additional treatment condition. This may be a potential limitation of our study as we deviated from procedures traditionally prescribed in the brief skill assessment literature.

Response blocking as an assessment procedure is a novel approach toward identifying skill and motivation deficits. Our results were promising, however, implementing response blocking as prescribed did require a therapist within close proximity and delivering their undivided attention to the participant throughout sessions. For this reason, replicating our procedures may be a daunting task – physically and financially – for clinicians. One resolution is to briefly evaluate the underlying effect of response blocking as punishment or extinction (Lerman & Iwata, 1996; Smith et al., 1999). This 1:1 staffing arrangement, however, may still be required if response blocking serves as extinction, and the therapist would need to maintain a near-perfect correspondence between blocking and inappropriate self-feeding attempts (Smith et al., 1999). A second resolution is to identify the efficacy of response blocking as a function of when the therapist interrupts in a response chain. McCord and colleagues (2005) assessed the effects of response blocking as a function of where therapists initiated the procedure within a response chain for pica for three individuals with severe IDD. This evaluation identified more efficient procedures when response blocking may be unavoidable. The researchers found that for two of three participants, pica was decreased only when response blocking was implemented earlier (i.e., when the participant attempted to touch the inedible objects) as opposed to later (i.e., when the participant attempted to bring the inedible object to his or her mouth) in the response chain. We implemented blocking later in the inappropriate self-feeding response chain to ensure the behavior met our definition, therefore warranting blocking. Blocking earlier in the response chain (e.g., when the child touches food with his or her fingers) may be more efficacious according to McCord et al. (2005) and is an empirical question of clinical significance. Researchers will, however, need to first identify that responses perceived to be earlier in a response chain (e.g., touching food with fingers) reliably precedes the target behavior (e.g., using

fingers to place food into mouth). Proceeding otherwise may result in a Type I error suggesting response blocking is more effective than it is. A third resolution is to systematically evaluate the relative effectiveness of response blocking versus conditioned punishers (e.g., “Stop”) to determine whether a less-restrictive, more-economical procedure can produce similar effects. A fourth resolution is to systematically evaluate conditioned discriminative stimuli (McCord et al., 2005) – for example, the vocal prompt, “Take a bite,” in the current study, which immediately followed the presentation of food during each trial. The pairing of the vocal prompt and food presentation may have conditioned the vocal prompt as a discriminative stimulus. Although we did not directly evaluate this, researchers may find doing so advantageous. Presenting a conditioned discriminative stimulus may serve as a more efficacious and socially valid procedure to evoking appropriate self-feeding. Further, researchers could systematically fade the use of the conditioned discriminative stimulus such that appropriate self-feeding reliably occurs under the control of the naturally presented discriminative stimulus: food. Researchers may also program for generalization of skills from sessions to actual mealtimes at home and other settings (e.g., restaurants, school). There are also several other inappropriate behaviors children engage in for which clinicians and researchers may find value in evaluating and treating by generalizing the current study’s procedures. These include identifying skill and motivation deficits for walking versus crawling (O’Brien, Azrin, & Bugle, 1972), using sign language versus vocal communication, incontinence versus continence, and inappropriate self-feeding versus appropriate self-feeding using utensils other than a spoon. Researchers and clinicians may encounter instances where additional procedures are needed to obtain accurate responding and appropriate self-feeding (e.g., supplemental most-to-least prompting for Elliot to mastery the skill of spoon to mouth) when extending our procedures. Consulting occupational therapists,

speech and language pathologists, and other healthcare professionals may help provide a further comprehensive evaluation of the participant's behavior and inform more appropriate and individualized procedures.

Our general procedures accounted for numerous suggestions made by Kerwin and Eicher (2004), which increased the study's social validity. One, the author's suggested sessions be in addition to meals because many children with IDD presenting a pediatric feeding disorder do not consume adequate nutrients throughout the day. We conducted sessions in conjunction with typically schedule meals rather than in place of these meals. We also collected data on the pre and post weight of food for each session as a measure of the grams of food each participant consumed. A full meal was also available following each session. We do caution that researchers attend to feeding behavior during session and post-session for a comprehensive measure of feeding. A child may begin to consume less food than typically observed during sessions but he or she will continue to consume the full post-session meal. This pattern of responding may suggest that aspects of the session environment serve as discriminative stimuli decreasing the likelihood of responding and the termination of session evokes feeding. Two, the author's suggested food presentation should be at least partially contingent on the completion of the previous trial. We included clean-mouth checks to ensure no food remained in the participants mouth just prior to delivering food for the subsequent trial. These procedures are consistent with the feeding literature (Piazza et al., 2002; Sharp, Harker, et al., 2010; Volkert et al., 2013; Wilkens et al., 2014). Three, the author's suggested implementing verbal instructions at the onset of trials to condition these as discriminative stimuli for engaging in appropriate self-feeding. We initiated each trial with the therapist's vocal prompt, "Take a bite." We also programmed a 5-s criterion for which the participant must have initiated the appropriate self-feeding response chain

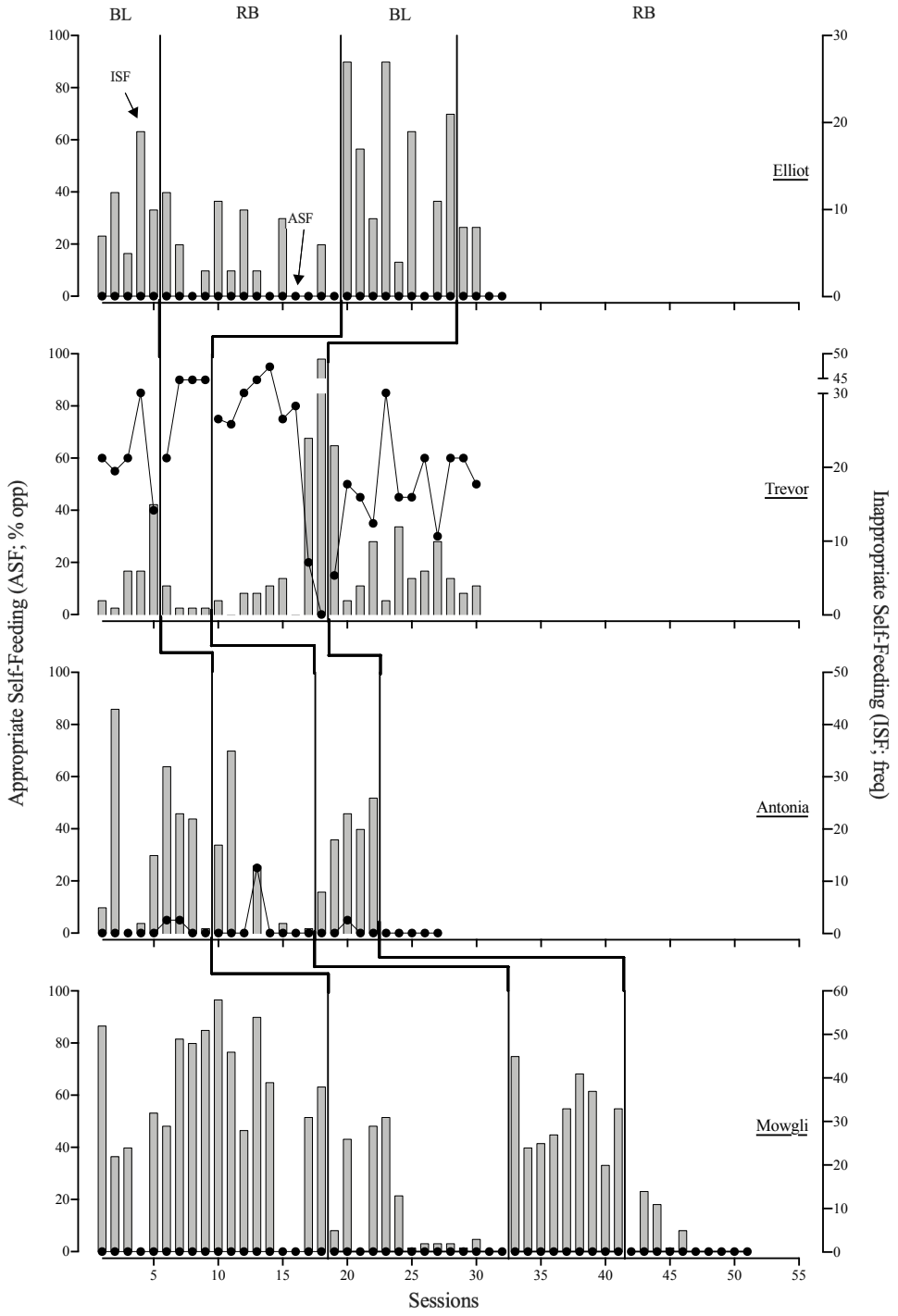
for us to score appropriate self-feeding. This ensured responding was correct and timely. Ideally, the vocal prompt will assume discriminative features such that the mere statement can later evoke appropriate self-feeding. An increase in appropriate self-feeding versus engaging in the initial task-analyzed component (i.e., pick up spoon) during the session but after the 5-s criterion may allude to these discriminative features; however, a true understanding of this is an empirical question. As previously mentioned, we did not specifically evaluate whether our procedures conditioned the vocal prompt as a discriminative stimulus, but this is a future research question to increase the feasibility of treatment in the natural environment. There are other avenues to increase social-validity and extend the literature on inappropriate self-feeding. Researchers could include the use of pre- and post-test videos and ask other professionals, teachers and therapists, and parents to rate the significance of treatment effects. There are also several psychometrically validated indirect assessments that measure aspects of pediatric feeding disorders (e.g., The Behavioral Pediatrics Feeding Assessment Scale [BPFAS; Crist et al., 1994]; The Brief Autism Mealtime Behavior Inventory [BAMBI; Lukens & Linscheid, 2008]), but few (e.g., The Children's Eating Behavior Inventory [CEIBI; Archer et al., 1991]) include questions addressing inappropriate self-feeding. Researchers could identify the predictive validity of these measures to increase the efficiency of the assessment process.

The immediacy with which pediatric feeding disorders result in negative outcomes influences the timeline on which professionals implement intervention. Professionals recommend early intervention but often formally prescribe such treatment only when the child presents behaviors producing severe, negative effects (Hutchinson, 1999). Most research, therefore, addresses the topographies of pediatric feeding disorders that produce these immediate side effects. Inappropriate self-feeding, if left untreated, has the potential to result in the same

negative outcomes as these other feeding problems. We offered a unique, proactive approach to mitigate the persistence of inappropriate self-feeding and its potential effects. We implemented response blocking as a brief assessment procedure to identify skill and motivation deficits. We then differentially prescribed treatment procedures matched to the deficit identified by the assessment. Our results suggest the validity of response blocking as an assessment procedure to identify skill and motivation deficits, as well as the generality of a brief assessment applied to inappropriate self-feeding.

Figure 1

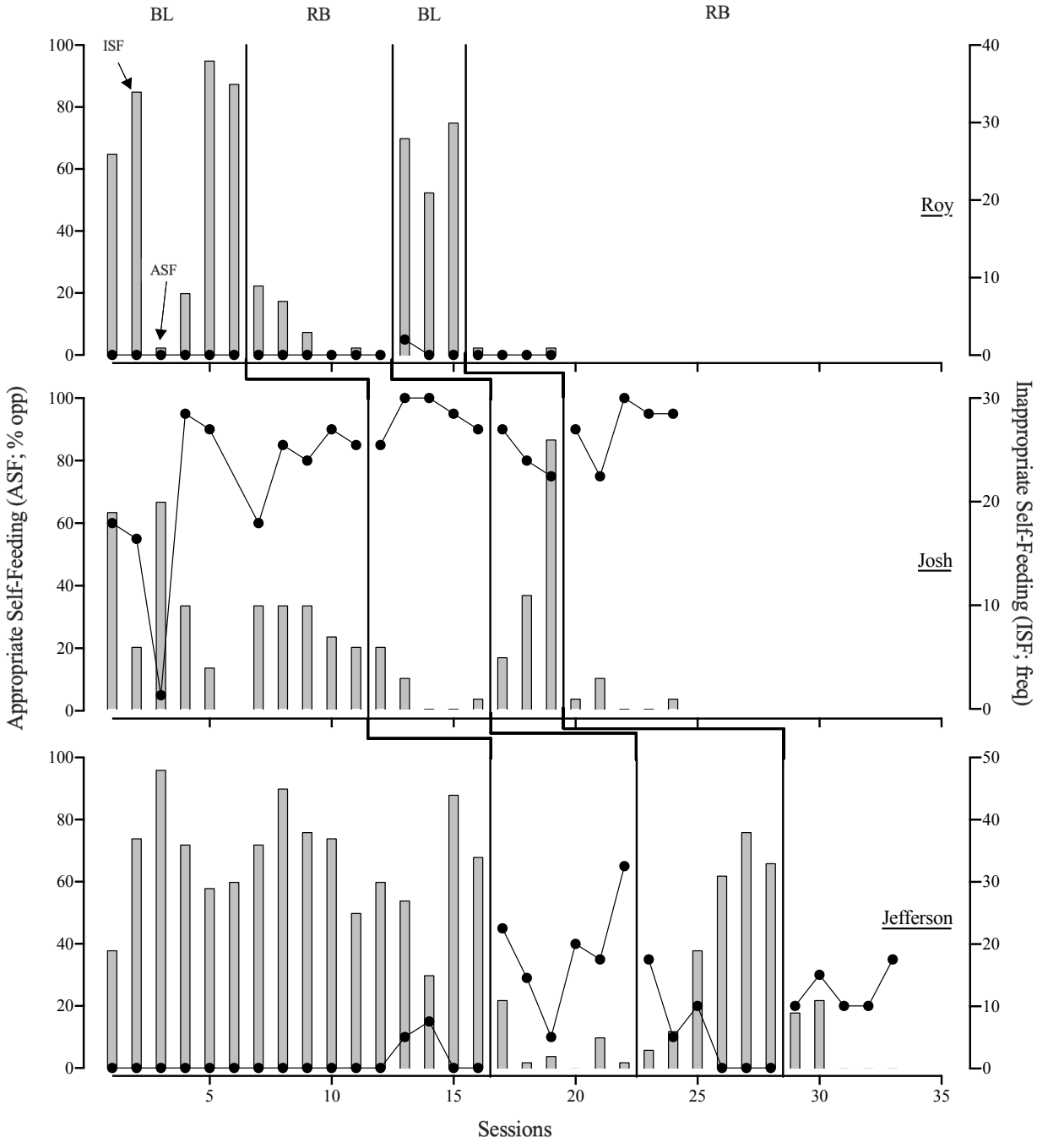
Assessment of Inappropriate Self-Feeding for Elliot, Trevor, Antonia, and Mowgli: Response Blocking to Identify Skill and Motivation Deficits



Note. BL = baseline; RB = response blocking.

Figure 2

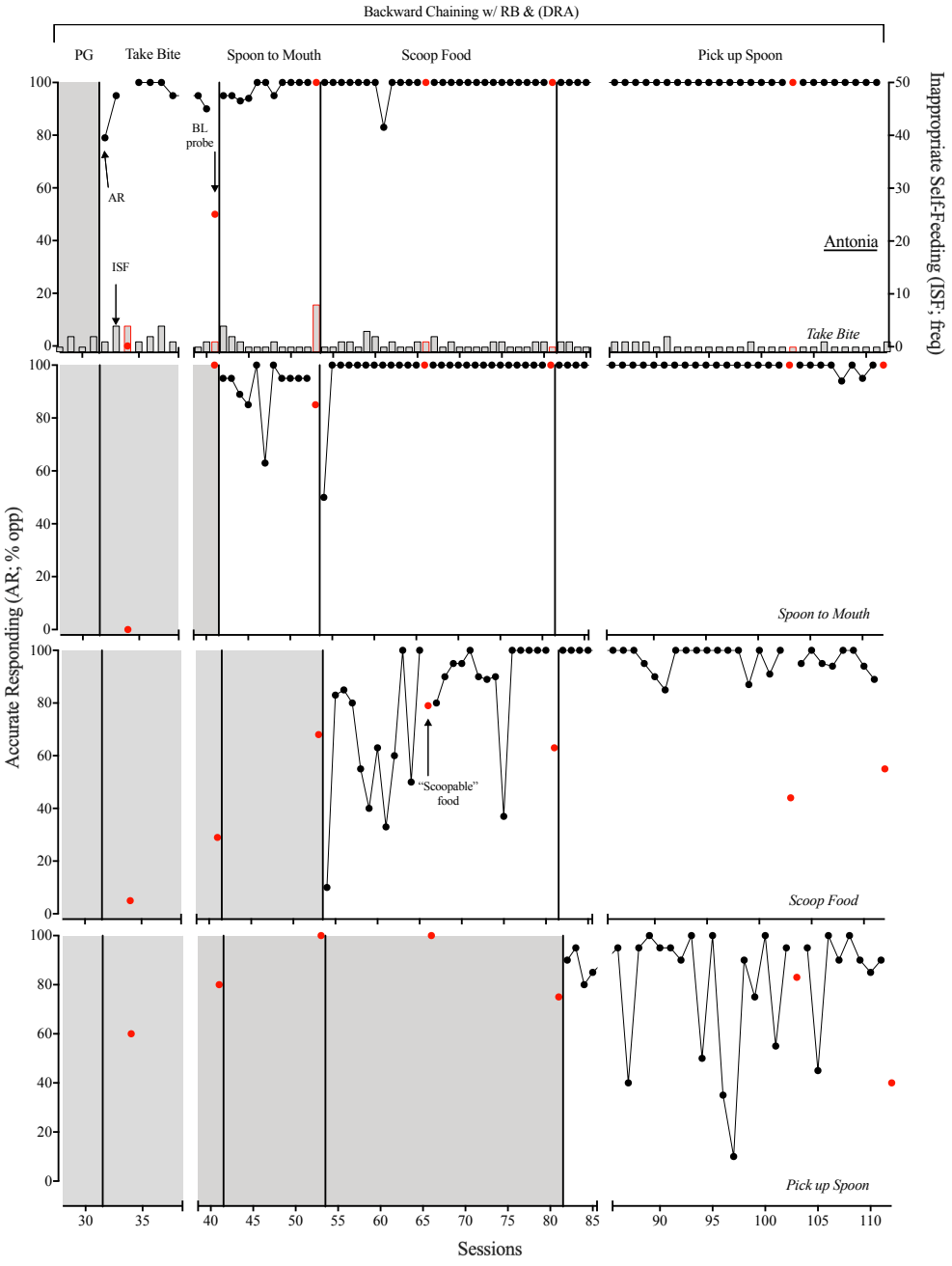
Assessment of Inappropriate Self-Feeding for Roy, Josh, and Jefferson: Response Blocking to Identify Skill and Motivation Deficits



Note. BL = baseline; RB = response blocking.

Figure 3

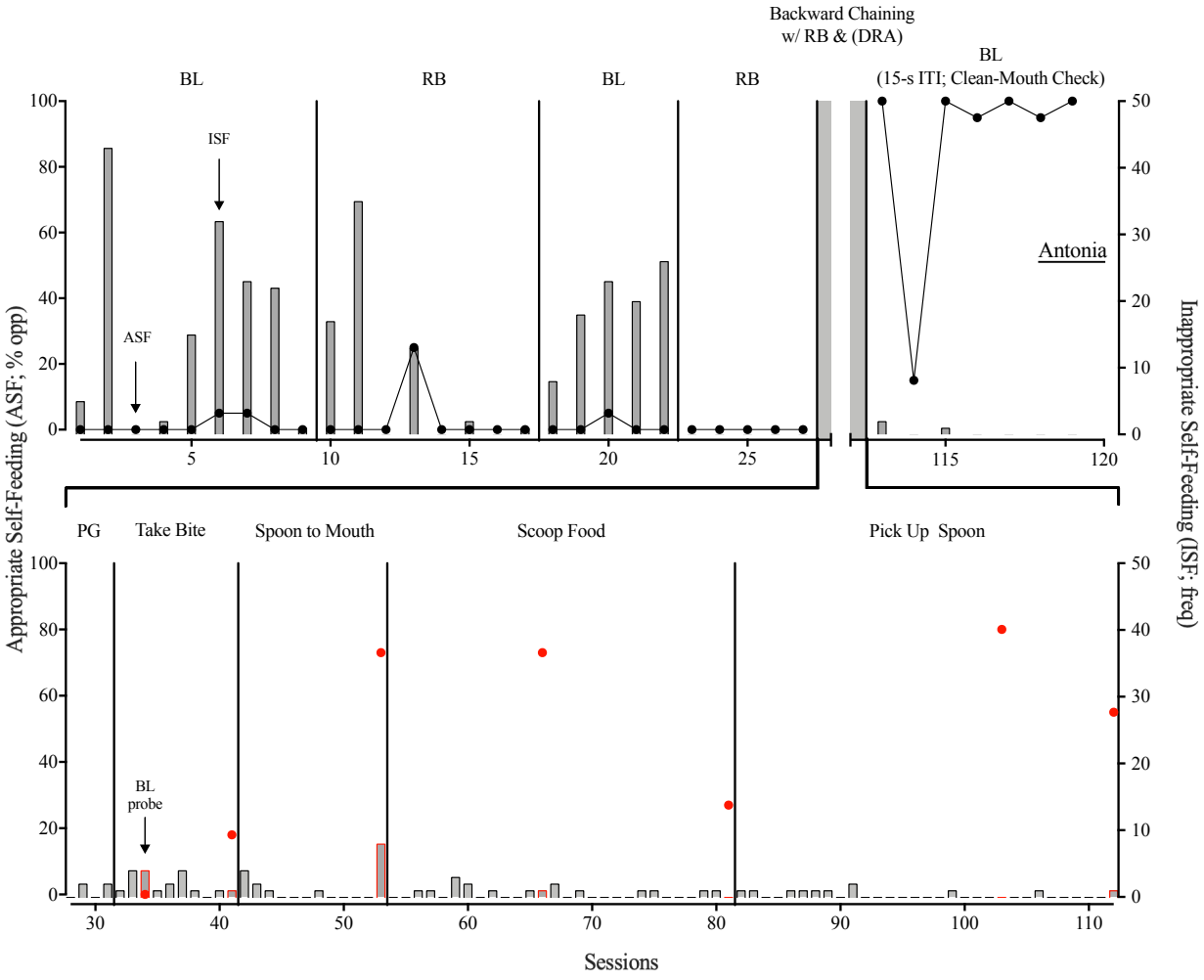
Treatment of Inappropriate Self-Feeding for Antonia: Skill Deficit, Backward Chaining



Note. These data depict Antonia's accurate responding and inappropriate self-feeding during backward chaining. PG = physical guidance; BL probe = baseline probe; Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; Grey = accurate responding unavailable because of prompting during backward chaining; x-axis break = extended periods away from session.

Figure 4

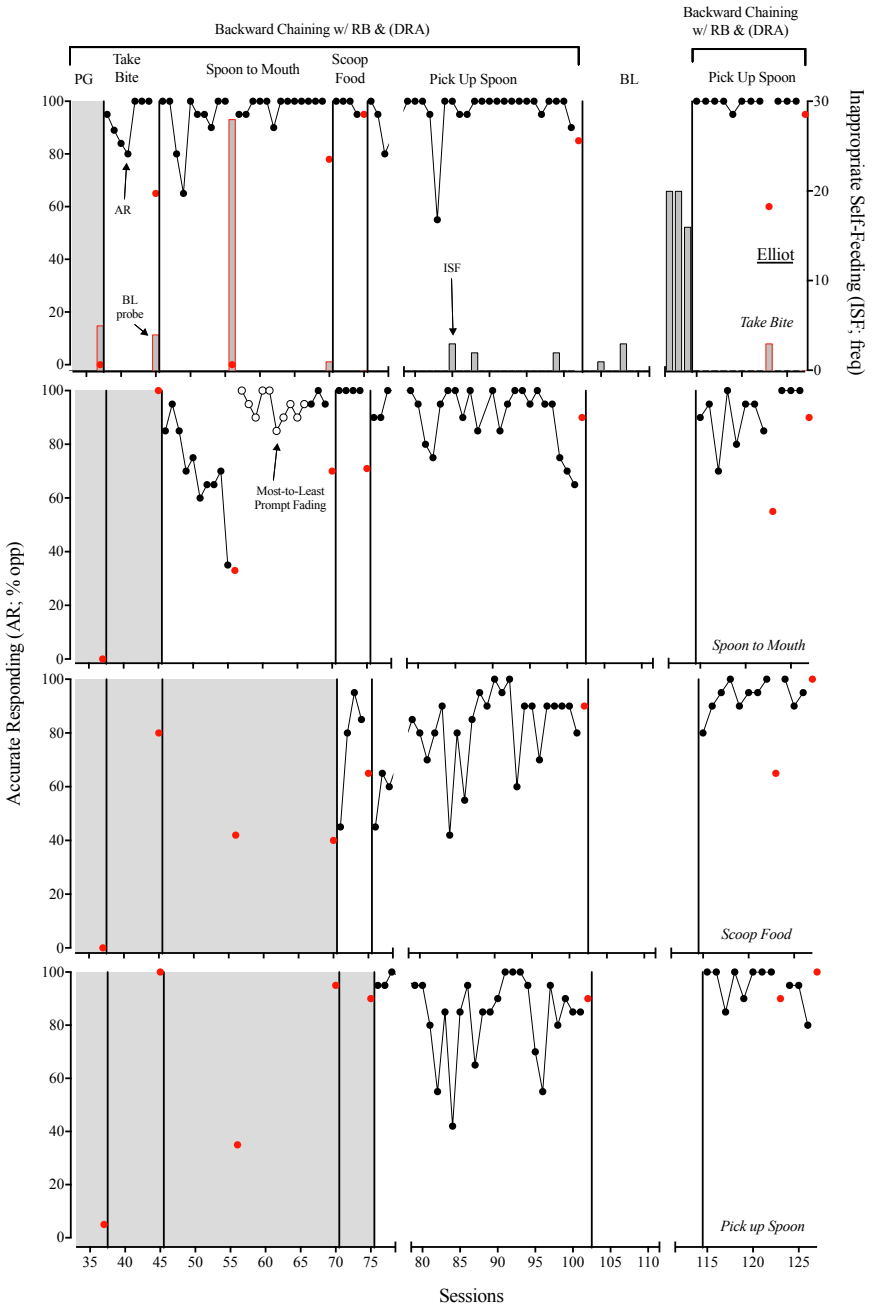
Assessment and Treatment of Inappropriate Self-Feeding for Antonia: Skill Deficit



Note. These data depict Antonia's appropriate and inappropriate self-feeding across assessment, treatment, and post-treatment conditions. All sessions included a 5-s intertrial interval and no clean-mouth check except the last condition (i.e., baseline). BL = baseline; RB = response blocking; Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; ITI = intertrial interval; x-axis break = encompass treatment.

Figure 5

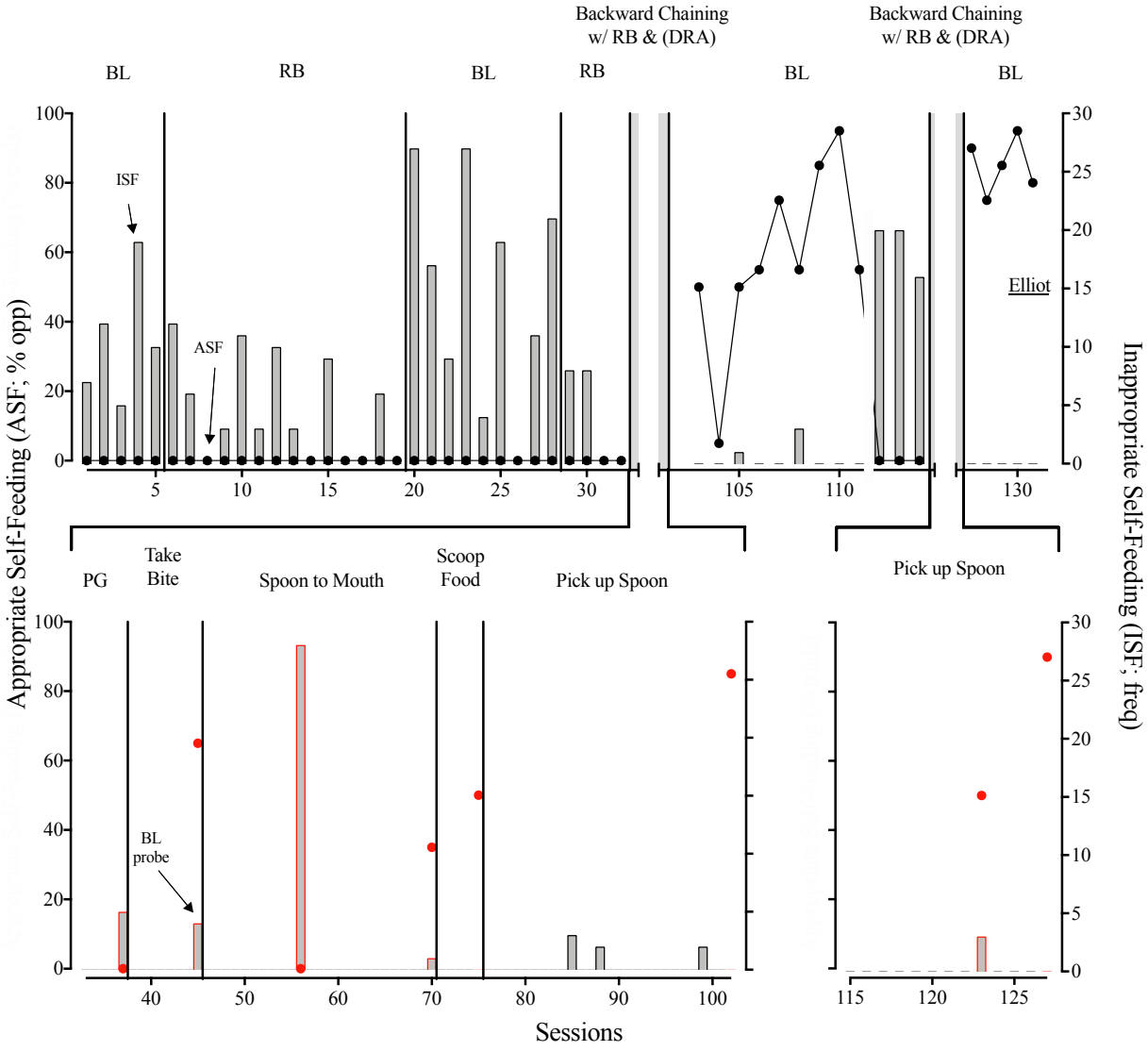
Treatment of Inappropriate Self-Feeding for Elliot: Skill Deficit, Backward Chaining



Note. These data depict Elliot's accurate responding and inappropriate self-feeding during backward chaining. PG = physical guidance; BL = baseline; Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; Grey = accurate responding unavailable because of prompting during backward chaining; x-axis breaks = extended periods away from session.

Figure 6

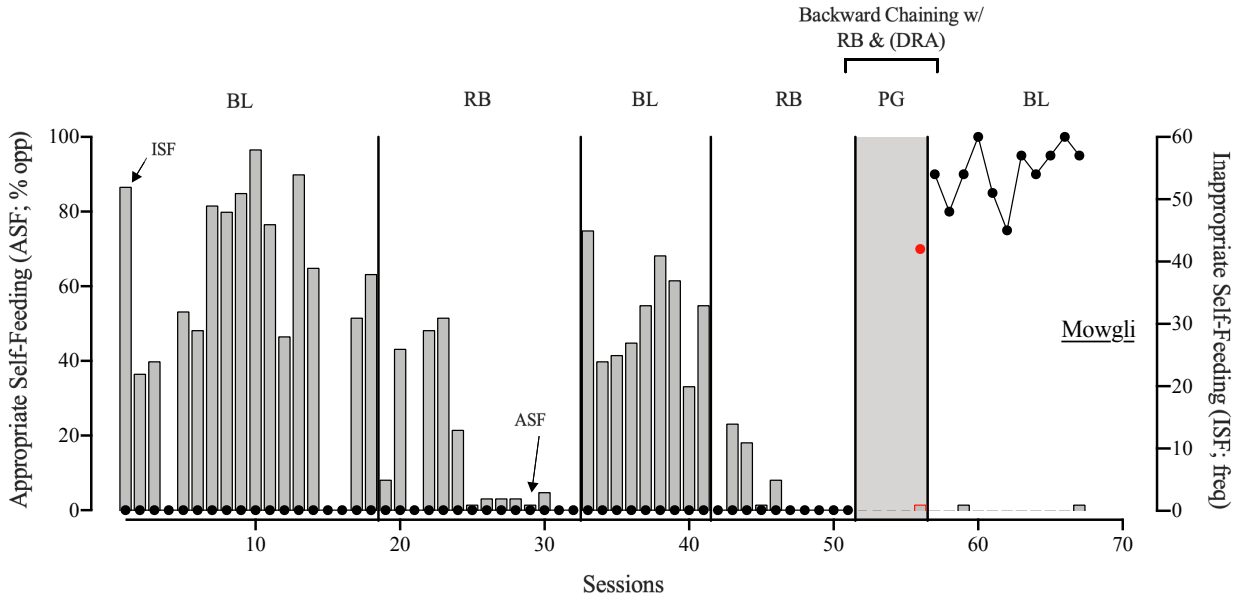
Assessment and Treatment of Inappropriate Self-Feeding for Elliot: Skill Deficit



Note. These data depict Elliot's appropriate and inappropriate self-feeding across assessment, treatment, and post-treatment conditions. BL = baseline; RB = response blocking; Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; x-axis breaks (Backward Chaining w/ RB & [DRA]) = encompass treatment; x-axis break (third BL condition) = extended period away from session.

Figure 7

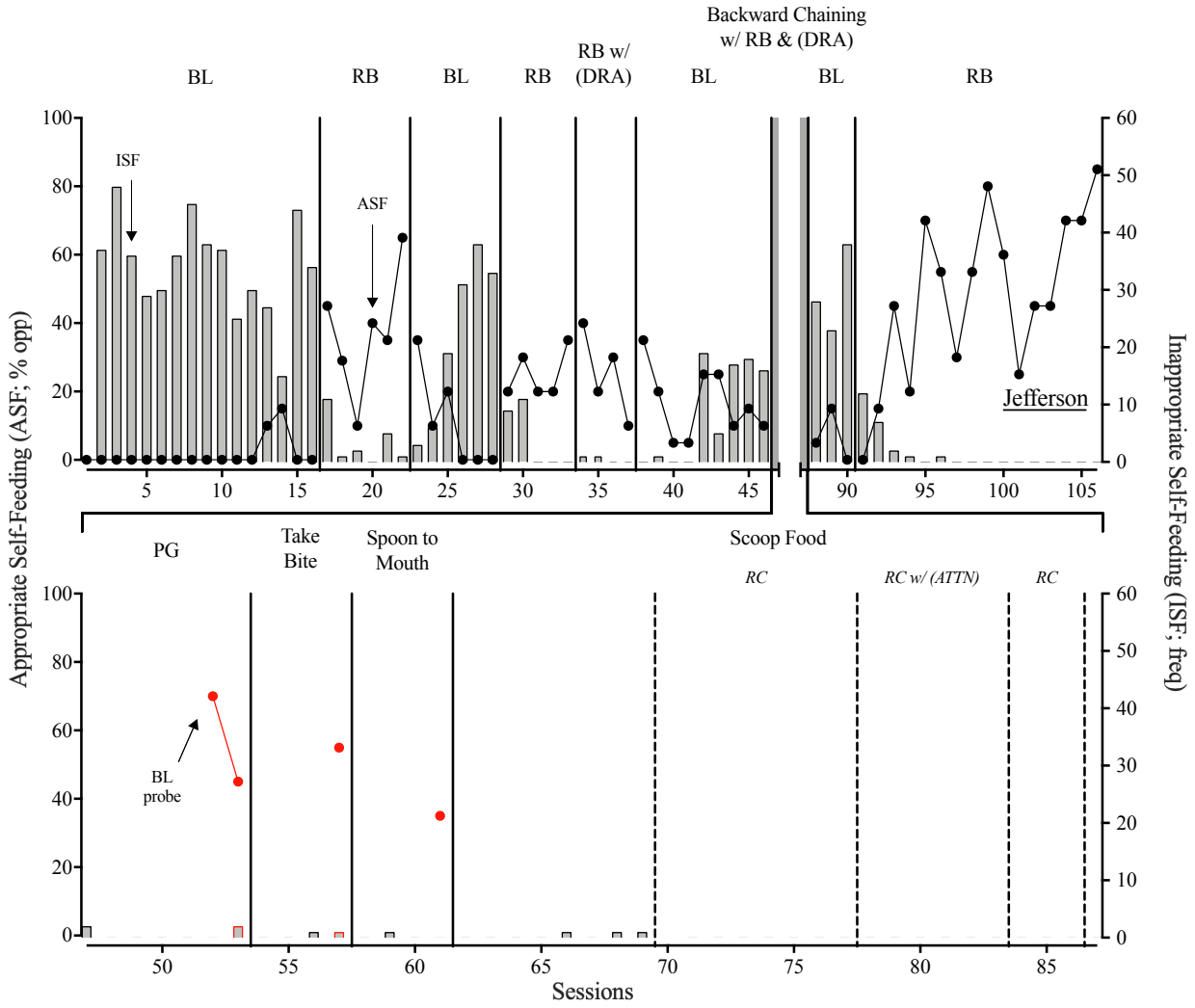
Assessment and Treatment of Inappropriate Self-Feeding for Mowgli: Skill Deficit



Note. These data depict Mowgli's appropriate and inappropriate self-feeding during the assessment, treatment, and post-treatment conditions. BL = baseline; RB = response blocking; PG = physical guidance; Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; Grey = accurate responding unavailable because of prompting during backward chaining.

Figure 8

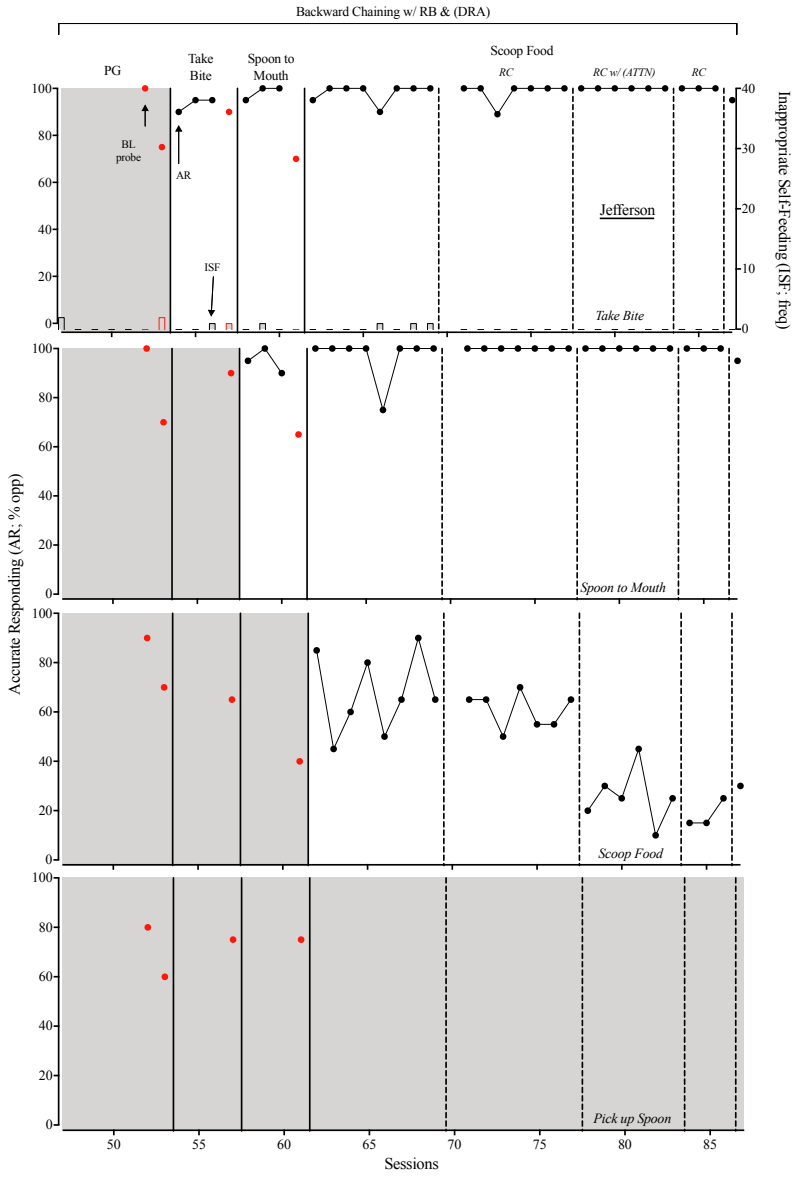
Assessment and Treatment of Inappropriate Self-Feeding for Jefferson: Skill and Motivation Deficits



Note. These data depict Jefferson's appropriate and inappropriate self-feeding across assessment and treatment. BL = baseline; RB = response blocking; RB w/ (DRA) = response blocking with programmed differential reinforcement of alternative behavior; Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; RC = response cost; RC w/ (ATTN) = response cost with programmed high-quality attention as additional reinforcer to programmed DRA; x-axis breaks = encompass treatment.

Figure 9

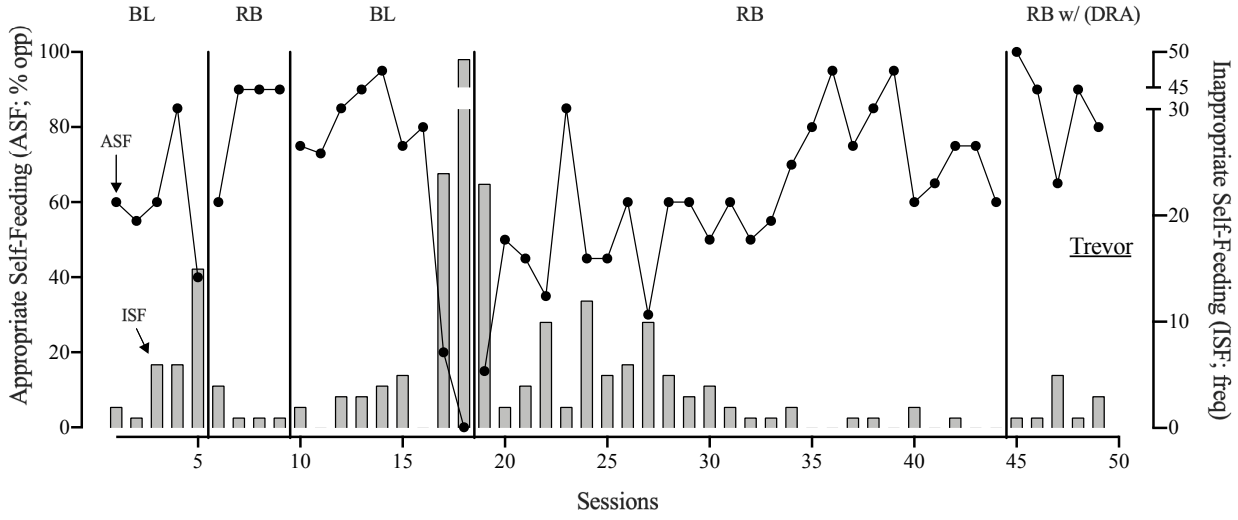
Treatment of Inappropriate Self-Feeding for Jefferson: Skill (and Motivation) Deficit, Backward Chaining



Note. These data depict Jefferson's accurate responding and inappropriate self-feeding during backward chaining. PG = physical guidance; Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; RC = response cost; RC w/ (ATTN) = response cost with programmed high-quality attention as additional reinforcer to programmed DRA; BL probe = baseline probe; Grey = accurate responding unavailable because of prompting during backward chaining.

Figure 10

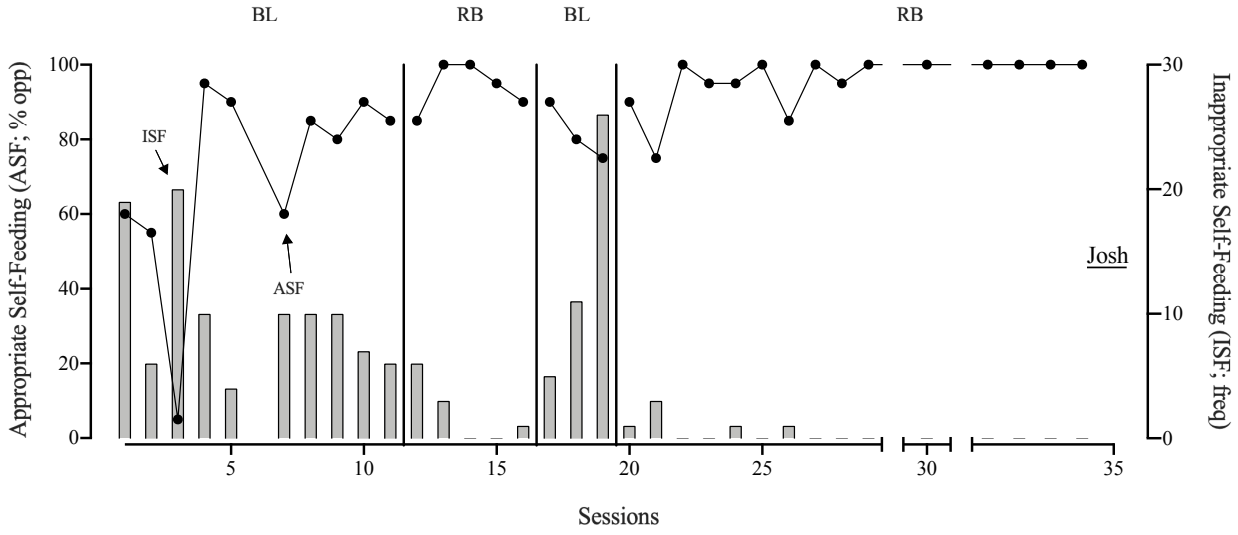
Assessment and Treatment of Inappropriate Self-Feeding for Trevor: Motivation Deficit



Note. These data depict Trevor's appropriate and inappropriate self-feeding across assessment and treatment. BL = baseline; RB = response blocking; RB w/ (DRA) = response blocking with programmed differential reinforcement of alternative behavior.

Figure 11

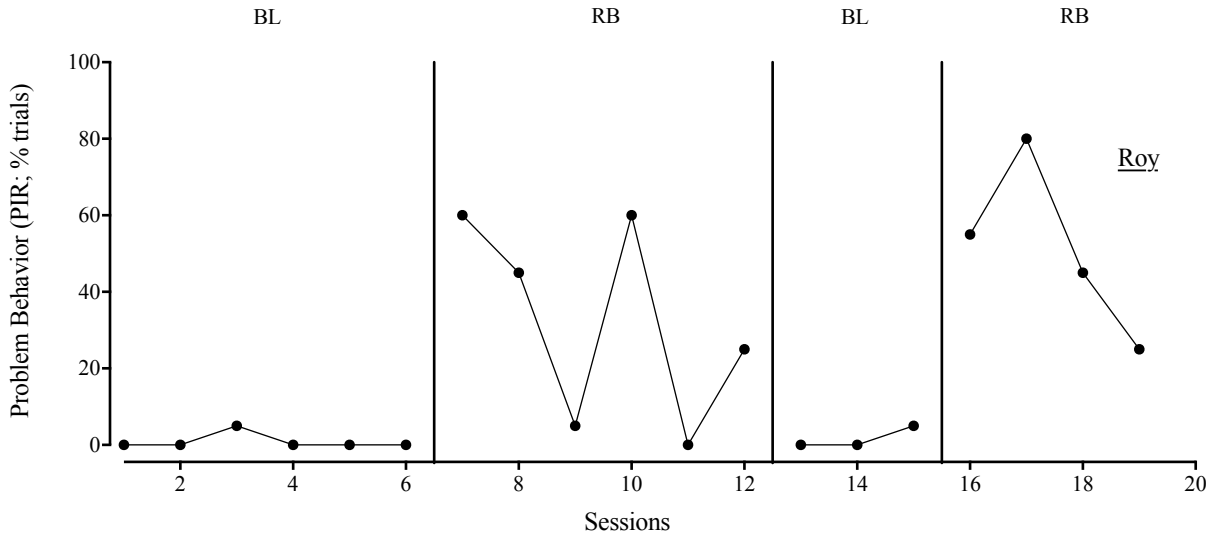
Assessment and Treatment of Inappropriate Self-Feeding for Josh: Motivation Deficit



Note. These data depict Josh's appropriate and inappropriate self-feeding across assessment and treatment. BL = baseline; RB = response blocking; x-axis breaks = extended period away from sessions.

Figure 12

Concomitant Effect of Response Blocking on Problem Behavior for Roy



Note. These data depict the concomitant effect of response blocking on Roy's problem behavior. BL = baseline; RB = response blocking.

Table 1

Overall Results for the Assessment and Treatment of Inappropriate Self-Feeding

	Assessment	Treatment		
Participant	Deficit Identified	Backward Chaining w/ RB & (DRA)	Extended RB	RB w/ (DRA)
Antonia	Skill	Yes		
Elliot	Skill	Yes		
Mowgli	Skill	Yes[1]		
Roy	Skill	*(no treatment conducted)*		
Jefferson	Skill/Motivation	No	Yes[2]	No
Trevor	Motivation[3]		No	Yes[4]
Josh	Motivation[3]		Yes	

Note. Backward Chaining w/ RB & (DRA) = backward chaining with response blocking and programmed differential reinforcement of alternative behavior; RB w/ (DRA) = response blocking with programmed differential reinforcement of alternative behavior; Yes = successful; No = unsuccessful.

[1] We observed mastery-level responding following the initial full-physical guidance phase.

[2] The assessment identified both deficits. We implemented treatment for a motivation deficit first (i.e., RB w/ [DRA]), which was ineffective. We then treated a skill deficit where responding continued to suggest, in part, a motivation deficit. Extended response blocking (i.e., treatment for motivation deficit) was eventually successful.

[3] Appropriate self-feeding high throughout the assessment.

[4] Inappropriate self-feeding observed at a low-level during treatment.

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