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Pilot Study of the Just Right Challenge Feeding Protocol for Treatment of Food Selectivity in Children

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Abstract

Background. This pilot study investigated the Just Right Challenge Feeding Protocol, a multicomponent treatment protocol for food selectivity that combines escape extinction, positive reinforcement, and systematic desensitization.

Method. This study used a single-subject, multiple-baseline-across-participants design to investigate whether treatment produced increases in the food inventories for seven children. All of the children in the study started with parent report of fewer than 15 foods in their dietary repertoire. A sensory profile for each child provided information for treatment planning and interpretation of the results of the study.

Results. Five out of the seven children accepted significantly more foods after a treatment latency period. These five children each had sensory profiles that indicated possible sensory overresponsivity. There was a statistically significant increase from baseline to the last treatment session on the mean number of foods on the inventory for the group.

Conclusion. The Just Right Challenge Feeding Protocol is a promising treatment for increasing food acceptance for some children with food selectivity. It may be particularly helpful for children with food selectivity and sensory overresponsivity.

Comments

The authors report that they have no conflicts of interest to disclose.

Keywords

food selectivity, feeding, treatment, autism, nutrition, systematic desensitization

Cover Page Footnote

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Credentials Display

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Family mealtime provides the opportunity for connection, and eating together has been linked to physical and emotional health for family members (Ausderau et al., 2019; Fruh et al., 2011; Rockett, 2007). Food selectivity has a detrimental impact on the occupation of mealtime. For example, food selectivity is associated with problem behavior during meals and spousal stress for caregivers of children with and without developmental disabilities (DD) (Curtin et al., 2015).

Food selectivity is defined as having a severely limited repertoire of accepted foods with food refusal and mealtime rigidity (Bandini et al., 2010; Roberts & Ausderau, 2016). Estimates of the prevalence of food selectivity in children with DD are as high as 80% (Schreck & Williams, 2006). Although children without DD also have food selectivity, an understanding of the nutritional implications of food selectivity is drawn from research in children with autism spectrum disorder (ASD). For example, children with food selectivity often refuse to eat fruits and vegetables and consume more processed foods with added sugar and fat (Suarez & Crinion, 2015). High consumption of these "empty calories" can displace more nutrient dense foods and impact long-term health (Slining & Popkin, 2013).

Food selectivity is complex. Developing effective treatment requires knowledge of associated factors. There is evidence that one key factor related to food selectivity is sensory overresponsivity (SOR) (Nadon et al., 2011; Smith et al., 2019; Suarez et al., 2012; Zobel-Lachiusa et al., 2015). SOR is defined as an overresponse to sensations that others would not perceive as threatening (Miller, 2014). Children with SOR may be experiencing a sympathetic nervous system fight or flight response to routine sensory experiences (Schoen et al., 2009). Given the growing evidence regarding the relationship between SOR and food selectivity, it is possible that children with food selectivity are having a sympathetic nervous system response to the sensations of eating. These responses may be particularly strong with foods that children have not identified as familiar and safe. This may be one factor to consider when implementing treatment for food selectivity.

The developing evidence for treatment of food selectivity includes two different approaches (Peterson et al., 2016). The first is drawn from a behavioral framework and has relatively strong support in the literature (Sharp et al., 2010). This approach centers on the use of escape extinction (Piazza et al., 2003; Silbaugh et al., 2016). For example, a systematic synthesis of behavioral interventions for food selectivity concluded that escape extinction (with differential reinforcement) may be a critical component of treatment for food selectivity (Silbaugh et al., 2016). The main assumption behind the use of escape extinction treatment is that the child's disruptive food refusal behavior is maintained by reinforcement in the form of escape from the feeding situation. Therefore, when escape is removed, the spoon is placed in front of the child until they take a bite (nonremoval of the spoon) or the child is physically guided to eat (i.e., the food is placed in the child's mouth). A child's refusal with distress or agitation (e.g., crying, hitting) and/or a negative physiological response (e.g., vomiting, gagging) is ignored and the child does not "escape" until they eat (Peterson et al., 2016). Studies have shown that escape extinction increases consumption of previously refused foods for children with food selectivity (Piazza et al., 2003; Sharp et al., 2010). However, this approach has the potential to be invasive and may be inappropriate for some children (Sharp et al., 2010; Williams et al., 2010). For example, a study by Vazques et al. (2019) asked parents to rate the acceptability of feeding treatments when given a hypothetical example. These parents rated escape extinction as the least acceptable. In addition, escape extinction targets food refusal behavior but does not address potential underlying factors associated with food selectivity, including SOR. Using escape extinction for children with severe and potentially life-

threatening food selectivity (e.g., at risk for G-tube) may be indicated. However, a less invasive approach may be appropriate for children with food selectivity that does not imminently threaten growth or survival (Silbaugh et al., 2016; Sharp et al., 2010; Weber & Gutierrez, 2015).

Children with food selectivity often have physiological and behavioral responses to refused foods that are consistent with the sympathetic nervous system's fight or flight response to threatening stimuli (e.g., attempting to escape the feeding situation, stringent food refusal) (Curtin et al., 2015; Marshall et al., 2014). Systematic desensitization, or progressive exposure to the feared situation coupled with strategies to reduce anxiety, is an alternative treatment approach (Kirsh, 2016; Koegel et al., 2004; Suarez, 2015). In one treatment for food selectivity that includes systematic desensitization, children are encouraged to use a food interaction hierarchy, or what Kay Toomey calls "steps to eating" (e.g., tolerate, touch, taste) (Toomey, 2010). This is done in a playful context to reduce the child's anxiety and sensitivity to refused foods (Benson et al., 2013; Boyd, 2007). This type of treatment appears to provide the optimal conditions for the development of the feeding relationship and for building a child's skills to tackle eating (Boyd, 2007). Therefore, it is a frequently used component of food selectivity treatment, particularly by occupational therapists (Peterson et al., 2016).

Despite the appeal of this treatment approach, empirical evidence for its use is still limited. One of the few studies of an intervention that included systematic desensitization (i.e., Sequential Oral Sensory Feeding Approach [SOS]) was described in a retrospective chart review by Benson and colleagues (2013) and demonstrated mixed results. After an average of 42 sessions of treatment, about half of the children demonstrated a positive trend in food interaction (e.g., getting closer to eating) and about half did not have food interaction that trended in a positive direction. Another study compared a modified version of this treatment approach (i.e., Modified SOS) to Applied Behavior Analysis that included escape extinction as a primary element (Peterson et al., 2016). Children in the escape extinction group ate previously refused foods during 80% of trials after 16 to 249 min of treatment. In contrast, children in the group that received systematic desensitization as one primary element underwent 1020 to 1292 min of treatment and did not increase food acceptance (eating). More work is needed to develop and investigate the efficacy of treatment protocols that consider and honor the child's reason for food refusal while facilitating increased consumption of previously refused foods.

The Just Right Challenge Feeding Protocol (JRCFP) is a multicomponent, manualized treatment for food selectivity (Suarez, 2015). This approach combines elements including escape extinction, positive reinforcement, and systematic desensitization. The purpose of this study was to investigate whether the JRCFP was effective at increasing the number of foods that the children accepted as part of their regular diet.

Method

This pilot study extended a feasibility study (Suarez, 2015) by using a more rigorous single-subject multiple-baseline-across-participants design (Kennedy, 2005). The Western Michigan University Human Subjects Institutional Review Board approved the study and consent was obtained. Baseline probes were collected while the client was waitlisted and during their feeding evaluation sessions. Although it is optimal to establish a stable baseline before initiating treatment, an ethical decision was made to allow the participants to begin as soon as a slot opened. This resulted in baseline probes ranging from 3 to 9 points with staggered start times.

Participants

Children enrolled in an outpatient feeding clinic were included if their parents reported that the child ate <15 foods and/or refused entire food groups that were listed on a food inventory questionnaire. The children were not required to have any other diagnoses to be enrolled in the study. Of the seven children in the sample, over half had an autism diagnosis, and one child had an additional cerebral palsy diagnosis. Of the children with autism, three-fourths used verbal communication to express wants and needs and the fourth used other means to communicate. The children without autism all had a DD with speech and language impairment being the most common.

Description of Intervention

A single occupational therapist delivered the JRCFP one time per week for 60 min. The treating occupational therapist was trained to deliver the manualized JRCFP by the developer through mentorship. The central element of the JRCFP is systematic desensitization with escape extinction at a level of just right challenge. In practice, the occupational therapist observes the child's level of anxiety with goal foods each week. For example, the therapist evaluates whether the child can stay calm (e.g., does not attempt to escape, is able to function while the food is present) while the food is on the plate. Then, based on this observation, she chooses a just right challenge target interaction (e.g., touch) for the next sessions trial with that food. The child is required to meet this interaction before moving away from the table. This is repeated with three to five goal foods during the session. Based on the child's performance, the occupational therapist adjusts the target the next week to optimally challenge the child. The goal is to have the child work up a food interaction hierarchy while ensuring that the child is calm and engaged in the interaction.

In addition to the process used during the session to have the child work up the food interaction hierarchy, parent education and home programming are essential elements of this treatment. Home programming follows two tracks. The first teaches parents how to help the child work up the food interaction hierarchy with all of the foods the family eats during mealtimes. The second track facilitates the food interaction hierarchy progress with specific goal foods outside of mealtimes.

Instrumentation

Demographic and descriptive data were collected from the parents and included the child's gender, age, diagnosis, and communication method.

Food inventory. Food inventories have been established as an appropriate way to capture a child's food repertoire (Bandini et al., 2010). The number of foods the parents marked on the inventory was the dependent variable in this study. The parents completed food inventory probes during baseline and treatment conditions to capture the number and specific foods that the child ate over the last week. This inventory contained 115 foods and "ate" was operationalized as voluntarily swallowing the food. Foods never marked on this inventory during baseline probes were designated as "refused."

Short Sensory Profile 2 (SSP2). The SSP2 (Dunn, 2014) was used to capture patterns of sensory processing. The SSP2 is a 34-item caregiver questionnaire that provides a classification of scores into four categories: seeking, avoiding, sensitivity, and registration. Children score in "much less than others," "less than others," "just like majority of others," "more than others," and "much more than others" for each category. The avoiding and sensitivity items relate to a low threshold for sensation (Dunn, 2014); taken together, they provide one indication of SOR (Miller 2014; Suarez et al., 2012). Testing of the reliability of the SSP2 indicates adequate internal consistency, good test-retest reliability, and acceptable interrater reliability (Dunn, 2014). In terms of validity, the SSP2 is correlated with the

original sensory profile suggesting the strong integrity of the original measure was retained (Wiggins et al., 2009). This instrument was administered during the initial evaluation to inform treatment and was used for interpretation of research results.

SOAP. Session data were recorded every week during treatment by the occupational therapist in a Subjective, Objective, Assessment, Plan (SOAP) format. Documentation included the child's food interaction hierarchy target (e.g., touch, lick-specific goal food) with the level of interaction that the child achieved. The JRCFP is not expected to produce immediate changes in a child's food acceptance. Therefore, this data was used to indicate when the children ate their first previously refused food in the clinic to mark the end of an expected latency period.

Fidelity tool. A researcher-developed fidelity tool was created for this study and used to determine if the treatment provided in this study aligned with the manual. This tool is a check-off list of 27 different structure and process elements. The first author, who designed the treatment, scored 12 random sessions with the intention of retraining if fidelity fell below 90%.

Analysis of Data

Consistent with single subject analysis methods, data from this study were graphed for visual analysis of differences between baseline and treatment phases for the number of foods on the food inventory (Kennedy, 2005). Using information from the SOAP, each graph indicates the sessions in which the children ate their first previously refused food to mark the end of the latency period. To measure effect size, the Percentage of Nonoverlapping Data (PND) was calculated twice between baseline and treatment phases. One calculation included the full dataset. The second calculation compared the baseline to treatment after the children had taken their first bite of a previously refused food to illustrate changes after the latency period (Riley-Tillman & Burns, 2009). The mean food inventory for baseline and treatment was analyzed using Wilcoxon Matched-Pairs Signed-Rank (Field, 2005).

Results

Demographic information, including the child's gender, age, and diagnosis and how the child communicates, are included in Table 1. In addition, the child's classification on the SSP2 is displayed. The children who participated in this study ranged from 2 to 13 years of age and six of the seven were male. Four of the children had ASD, with one having an additional diagnosis of cerebral palsy. Two of the children had a speech and language disorder, and one had a congenital heart defect with DD. All of the children in the study except two scored more and much more on SSP2 for both avoiding and sensitivity, potentially indicative of SOR.

Table 1

Demographic and Sensory Profile Information

Participant Number	Gender	Age in Years	Diagnosis/ Communication Method	Short Sensory Profile 2 Classification			
				Seeking	Avoiding	Sensitivity	Regulation
1	M	9	DD/Verbal	Less	Less	Just like	Less
2	F	4	ASD, CP/Verbal	Just like	Much more	More	Just like
3	M	3	ASD/Verbal	Just like	More	Much more	Just like
4	M	4	SLD/Verbal	Just like	More	Much more	Just like
5	M	13	ASD/Verbal	Just like	More	Much more	More

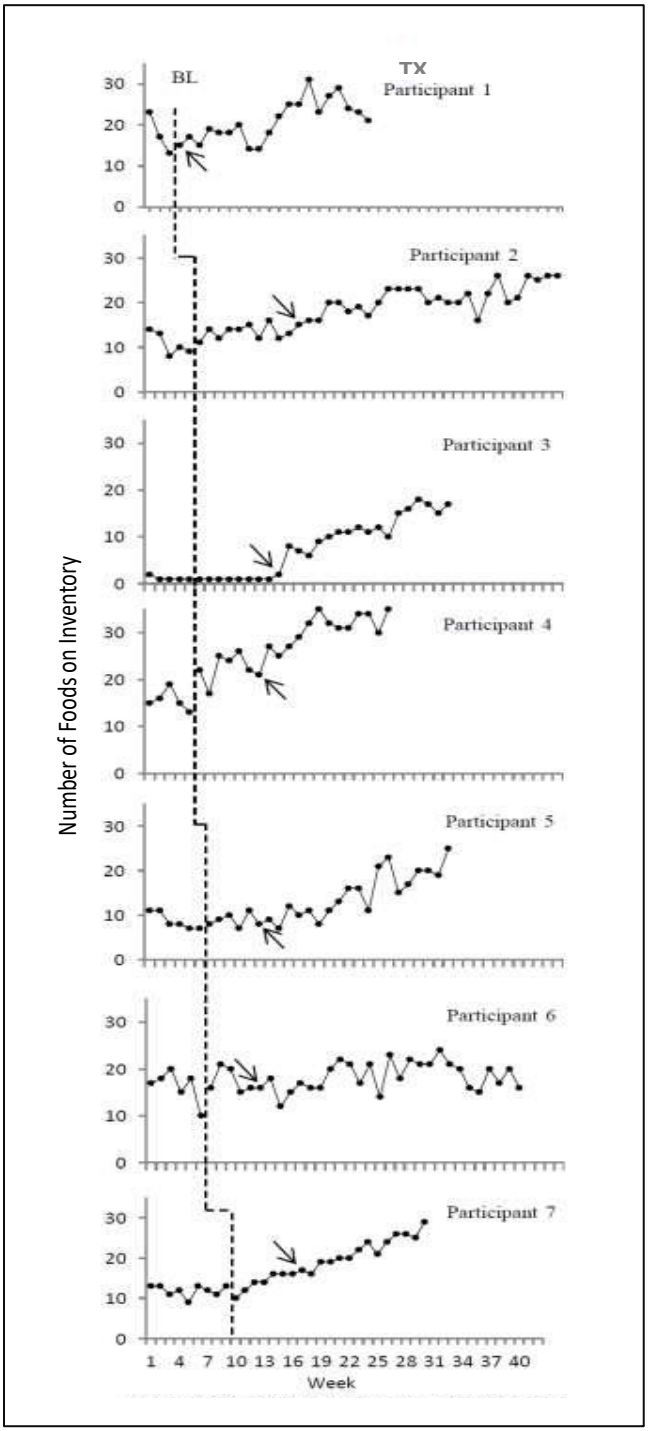
6	M	2	ASD/Non-Verbal	Just like	Just like	More	Just like
7	M	7	SLD/Verbal	Just like	More	Much more	Just like

Note. DD = Developmental Disability, ASD = Autism Spectrum Disorder, CP = Cerebral Palsy, SLD = Speech and Language Disorder.

The number of foods that the parents reported each child ate over the previous week during baseline and treatment phases are displayed in Figure 1.

Figure 1

Weekly Food Inventory Data Across Baseline (BL) and Treatment (TX) Conditions



Note. Arrow = First bite of nonpreferred food in clinic.

The session in which the child ate the first previously refused food in the clinic is marked with an arrow. Table 2 contains the PND for each child comparing baseline to treatment data and baseline to treatment data after the child took the first bite of a previously refused food. In this table, consistent with Scruggs and Mastropieri's (1998) recommendations regarding treatment effectiveness, PND less than 50% are marked "ineffective," scores in the 50% to 70% range are marked "questionable," scores in the 70% to 90% range are marked "effective," and scores in the 90% plus range are marked "very effective."

Table 2

PND for Total Data Set and After First Bite of Nonpreferred Food (Latency Period)

Participant Number	PND total Data Set	Intervention Effectiveness	PND Latency Period	Intervention Effectiveness after Latency Period
1	30%	No Effect	30%	No Effect
2	78.4%	Effective	100%	Very Effective
3	65.4%	Questionable	100%	Very Effective
4	95%	Very Effective	100%	Very Effective
5	48.0%	No Effect	63%	Questionable
6	31%	No Effect	50%	No Effect
7	90.5%	Effective	100%	Very Effective
Average PND	62.6%	Questionable	77.6%	Effective

Table 3 contains the child's mean food inventory number over the baseline and treatment weeks. Because of the small data set that was not normally distributed, Wilcoxon Matched-Pairs Signed-Rank was used to compare the average number of foods the child ate between the two conditions. There was a significant increase from baseline to treatment on the food inventory (Baseline: $M = 13.57$ $SD = 6.37$, Treatment: $M = 24.14$ $SD = 6.74$, $p = .018$).

Table 3

Mean BL and TX Food Inventory (FI) at Pre and Posttreatment

Participant Number	Mean BL FI	Mean TX FI
1	17.67	20.9
2	10.80	18.83
3	1.20	8.27
4	15.60	27.95
5	8.67	13.48
6	16.33	18.34
7	11.89	19.33

Fidelity checks were completed by the first author with 12 randomly chosen sessions. These checks indicated that 10 of the 12 sessions achieved 100% fidelity and two of the 12 sessions achieved 94% fidelity. None of the sessions fell below 90% and review with the interventionist was never completed.

Discussion

Feeding challenges have a significant impact on a child's participation in the occupation of the family meal and limit the psychosocial and health benefits that eating together can provide (Ausderau et al., 2019; Fruh et al., 2011). Increasing food variety for children with food selectivity may reduce mealtime behaviors and overall family stress during meals (Curtin et al., 2015). Having a wider repertoire of accepted foods could also contribute to greater nutritional adequacy (Suarez & Crinion, 2015).

This study tested the effectiveness of the JRCFP for increasing the number of foods in the dietary repertoires of seven children. After an expected latency period, this intervention was effective for four participants, questionable for one, and not effective for two. There was a statistically significant difference between the mean pre and post food inventories for the group as a whole.

It is interesting to note that the two children who did not improve the number of foods that they accepted also did not have sensory profiles that strongly indicated SOR. It has been hypothesized that SOR may be one underlying cause of food selectivity (Nadon et al., 2011; Suarez et al., 2012). It is possible that the JRCFP protocol is best suited for children with food selectivity who have this pattern of sensory processing. If these children are having a sympathetic nervous system response to the sensations of eating, systematic desensitization with escape extinction at a level of just right challenge may facilitate a reduction in the stress response to food over time with this graded exposure. This is an area that needs more exploration. However, the child's sensory profile, and the presence of SOR, may be one factor to consider when choosing food selectivity treatment.

Systematic desensitization has been used successfully to decrease a child's overresponse to sensation (e.g., auditory) (Koegel et al., 2004). The JRCFP is not the first to use systematic desensitization as a primary element for food selectivity (Benson et al., 2013; Boyd, 2007; Peterson et al., 2016). However, the JRCFP is unique in that it combines the use of systematic desensitization with behavior elements. Specifically, the JRCFC sets expectations for interaction with food along a food interaction hierarchy that are set at a level of just right challenge. Then, escape extinction and positive reinforcement are used to support the child meeting this expectation. Setting and reinforcing a food interaction expectation may be an essential element for increasing food acceptance in some children.

Although the children in this study increased the number of foods that they accepted on the food inventory, this increase was most notable after a period of latency. It is important to note that the JRCFP appears to take time for the child to work progressively toward eating goal foods. This information could be shared with parents as they begin treatment to avoid frustration. This latency period could also be accounted for in future studies to ensure that meaningful change is not missed because of an inadequate number of treatment sessions.

Limitations

This study had several limitations. First, this study had a small sample and did not include criteria for diagnosis. Therefore, characteristics of the child's diagnosis could have confounded results. Next, although the parents were provided with unambiguous criteria for marking food on the inventory, there is a need to measure food acceptance more objectively. In addition, further research is needed to determine if the child's nutritional profile can be improved and whether the quality of mealtime increases for families who undergo this treatment with their children. Finally, this was the first study of the JRCFP. More research is needed to identify the components of the program that produce change. Despite limitations, this work can inform food selectivity treatment.

The findings from this study have implications for occupational therapy practice:

- Understanding a child's sensory profile, and the presence of SOR, may assist with matching food selectivity treatment to the child's needs.
- Systematic desensitization, along with food interaction expectations set at a level of a just right challenge, may be essential elements for adding new foods to some children's diets.

Conclusion

This pilot study provides preliminary evidence for using systematic desensitization combined with behavioral principles to increase the dietary repertoires of children with food selectivity. Occupational therapists provide client-centered care that respects internal processes (e.g., SOR) that may contribute to food refusal. At the same time, occupational therapists are experts at grading challenge and shaping behavior for occupational engagement. Therefore, occupational therapists have essential skills for respectful treatment of food selectivity. The JRCFP may be one approach to guide clinical reasoning.

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