

Acquisition of Self-Feeding in a Child with Lowe's Syndrome

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Lowe's syndrome is a developmental disorder in which children must receive supplemental nutrients in their food to sustain health and proper metabolic functioning. This case study describes a training program for a boy with Lowe's syndrome who refused to feed himself and had become dependent upon caregivers at meals. The program provided sensory reinforcement (light and music stimulation) contingent upon the child's performance of graduated steps in a self-feeding sequence combined with stimulus control procedures. As evaluated in a changing criterion design, the child acquired independent self-feeding rapidly and results were maintained up to 1 year following training.

KEY WORDS: Lowe's syndrome; feeding disorders; behavior shaping; changing criterion design.

INTRODUCTION

Deficits in self-feeding represent a common mealtime problem among children with developmental disabilities (Luiselli, 1989). In some cases, a child may demonstrate a total absence of self-feeding responses, such as grasping utensils, scooping food, or transporting food items from plate to mouth. Other children may possess the motor abilities to feed themselves but actively refuse to do so. Finally, there are situations where a child has acquired the rudimentary steps toward self-feeding but requires further training to expand his/her skills repertoire (e.g., cutting with utensils, napkin use).

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An absence of self-feeding usually means that the child must be fed by another person. This requirement can be extremely time-intensive, particularly when several children are integrated within a group mealtime format. Continued feeding by another person also leads to a dependency on the part of the child. For these reasons, establishment of independent feeding is a primary training objective for children who are developmentally disabled (Sisson & Van Hasselt, 1989).

This report describes an unusual case of behavioral intervention for self-feeding deficits in a child with Lowe's syndrome. The disorder, also known as oculo-cerebro-renal syndrome, is a rare genetic dysfunction affecting males and associated with multiple handicaps, including congenital cataracts, glaucoma, hypotonia, rickets, and short stature. The two dominant afflictions in Lowe's syndrome are renal tubular dysfunction whereby there is an abnormal loss of nutrients into the urine (bicarbonate, phosphate) and acidosis, an imbalance in the body's acid-base balance caused by bicarbonate wasting. Boys with Lowe's syndrome must take medication regularly to replace those substances that are lost in urine. Without the addition of supplements such as alkaline, phosphorous, and vitamin D, a life-threatening condition can develop. In fact, untreated bicarbonate loss is considered a primary cause of death. The present case is significant in that the child had a lengthy history of refusing attempts to self-feed and actively resisted prior interventions. Given his medical condition, it was mandatory that he receive daily supplements in his food and so, he was routinely fed by another person. The goal of treatment was to overcome this dependency on others by gradually introducing self-feeding demands and reinforcing successive approximations toward, and ultimately the completion of, independent feeding responses.

METHOD

Participant

Alan was a 10-year-old boy with a medical diagnosis of Lowe's syndrome. He was the product of a full-term pregnancy, experienced severe respiratory complications at birth, and was hospitalized for 3 months due to chronic vomiting. Alan had congenital glaucoma, a visual acuity of 20/400 in the left eye, and a dense cataract with no usable vision in this right eye. He had general hypotonia in his lower and upper extremities, wore leg braces, and could ambulate with physical support. Alan used one- to three-word phrases to express himself but typically verbalized in a nonfunctional manner by repeating words from songs or television commercials. On the

self-help skills subtest of the Brigance Inventory of Early Development he attained an age-level of 2.0 years.

Discussions with Alan's mother and his teacher revealed that he never fed himself and resisted any attempts to eat independently. It was reported that he would refuse to hold a utensil and would usually push away or throw any objects placed in front of him, such as a plate, bowl, or serving dish. Alan's diet consisted of food that was pureed in a blender, and it included most meat, vegetable, and poultry products. At each meal sodium bicarbonate and phosphorous supplements were added to his food. Meals consisted of his mother or teacher placing individual spoonfuls of food directly into his mouth. Alan consumed the food compliantly in this manner and generally ate all the food that was presented to him. However, his mother indicated that if, "pushed too far," Alan would begin to refuse meals and reject feeding attempts by others. Therefore, the avoidance of possible food aversion stemming from introduction of a self-feeding program was of critical concern.

Setting

The study was conducted in a classroom setting located in a special education school building. A total of six children comprised the classroom and it was staffed by a certified teacher and two assistants. For purposes of program implementation and evaluation, all data recording and training procedures were performed by the teacher. Two locations in the classroom were utilized. During baseline and follow-up phases Alan's lunch meal was served to him at a group table that included the other students, staff, and his teacher, who sat at his left side. During the training phase the lunch meal was served in a small partitioned area of the classroom that contained a small table, two chairs, and objects to deliver reinforcement (see below). The teacher also sat at Alan's left side but only she was present during training meals.

Response Definitions and Recording Procedures

A *feeding trial* was defined as a sequence of the following six steps:

1. Grasp spoon.
2. Scoop food from plate with spoon.
3. Transport spoon to mouth.
4. Insert spoon into mouth/consume food.
5. Withdraw spoon from mouth.
6. Return spoon to plate.

During each daily lunch meal, data were recorded for the initial 20 feeding trials. The teacher used a precoded recording form at each meal, and Alan's independent completion of steps for each trial was scored. Data were summarized at the conclusion of each meal to yield a measure of percent independent self-feeding [steps completed independently/total steps per meal \times 100].

Interobserver agreement was assessed on six occasions during the study and consisted of the author recording data simultaneously with the teacher. Assessments were performed during one baseline, four training (Phases A, B, C, E), and one follow-up (3-month) meal. Percentage agreement was calculated by dividing the number of feeding trials that were scored identically, by the total trials for the meal (20), and multiplying by 100. Agreement was 100% on all occasions.

Experimental Design and Procedures

The study incorporated a changing-criterion (Barlow & Hersen, 1984) design with a follow-up phase to evaluate response maintenance.

Baseline

Alan's meal was presented to him and he was requested to "feed himself." The meal preparation consisted of positioning his plate in front of him on the table, with pureed mixture on the plate, and spoon extending from the plate. The plate featured a large rim around the side to facilitate scooping. If Alan refused to grasp the spoon and self-feed for a feeding trial, the teacher waited approximately 15 sec and then fed him one spoonful of food. She then waited another 15 sec whereafter she again requested self-feeding for another trial. This sequence of presenting requests and then offering food continued for 20 trials. Subsequently, the remainder of Alan's meal was fed to him. Again, this arrangement was necessitated by his medical condition.

Skill Acquisition Training

Several observations emerged during baseline assessment. First, Alan refused to comply with any self-feeding requests. Second, he displayed varying degrees of agitation that included verbal protests (e.g., "No-no eat!") and leaning against the teacher. And third, he demonstrated attempts to push the plate away and throw the spoon. Given these results

a decision was made to design a training program that would: (a) break down the self-feeding sequence further into smaller composite steps, (b) gradually introduce self-feeding requirements, and (c) provide reinforcement for compliance and mastery at each step. The objective was to establish approximations toward self-feeding without provoking agitation or refusal.

As stated previously, the lunch training meal was conducted in a small partitioned area of the classroom. In addition to a table and chairs, a large rectangular box that provided incandescent illumination and a record player were located in the area. These devices were used to deliver reinforcement in the form of light and music. Prior to the study Alan's teacher was requested to list his most pleasurable activities and types of stimulation. She indicated bright lights and music as reinforcing stimuli. In this situation, the light box was positioned on the table, directly in front of Alan while the record player was placed beside the teacher on a separate table. Each time Alan independently completed the criterion steps on a feeding trial (described below), the teacher praised him ("Good feeding yourself!"), turned on the light source, and activated the record player. The light and music remained ongoing for approximately 15-20 sec, were then discontinued, and another feeding trial was initiated. A continuous schedule of reinforcement remained in effect throughout the training phase.

The training program was sequenced into six conditions that included a combination of shaping and stimulus control procedures. These conditions are presented in Table I. During each successive condition Alan was required to complete an increasing number of steps in the feeding sequence independently in order to receive reinforcement (criterion steps). At conditions A through D, the distance required to transport the spoon to his mouth was increased gradually. Thus, under these conditions he was independently completing four of the six steps (66.6%) comprising a feeding trial (grasp spoon, transport, insert/consume, withdraw from mouth). At condition E, the criterion increased to five of the six steps (83.3% with addition of returning spoon to plate] and all six steps at condition F [100% with addition of scooping food).

The stimulus control features of training included the gradual introduction of eating from a plate by slowly introducing a stimulus onto the table (circular marker), then an empty plate, and finally the plate with food present. A graduated introduction of the plate was chosen so as not to disrupt the sequence of steps that Alan had already acquired. As noted earlier, he tended to push at the plate and show distress at its appearance prior to intervention.

Table I. Training Conditions

Condition	Criterion	Teacher's Response	Alan's Required Response ^a
A	C-1	Present one spoonful of food to Alan, at his eye-level.	<u>Grasp spoon</u> , <u>transport to mouth</u> , <u>insert spoon/consume food</u> , <u>withdraw spoon</u> , hand spoon to teacher.
B	C-1	Present one spoonful of food to Alan, one-half way between his eye-level and table top.	<u>Grasp spoon</u> , <u>transport to mouth</u> , <u>insert spoon/consume food</u> , <u>withdraw spoon</u> , hand spoon to teacher.
C	C-1	Present one spoonful of food to Alan while spoon rests on table top.	<u>Grasp spoon</u> , <u>transport to mouth</u> , <u>insert spoon/consume food</u> , <u>withdraw spoon</u> , place spoon on table top.
D	C-1	Present one spoonful of food to Alan while spoon rests on a circular marker [plate size] that is on table top.	<u>Grasp spoon</u> , <u>transport to mouth</u> , <u>insert spoon/consume food</u> , <u>withdraw spoon</u> , place spoon on marker.
E	C-2	Present one spoonful of food in an empty plate positioned on the circular marker.	<u>Grasp spoon</u> , <u>transport to mouth</u> , <u>insert spoon/consume food</u> , <u>withdraw spoon</u> , place spoon in plate.
F	C-3	Place spoon in plate that contains lunch meal [at start of meal].	<u>Grasp spoon</u> , <u>scoop food</u> , <u>transport to mouth</u> , <u>insert spoon/consume food</u> , <u>withdraw spoon</u> , place spoon in plate.

^aUnderlined responses represent those comprising the six-step feeding trial. Reinforcement was contingent upon 66.6% (4/6) of steps completed at C-1, 83.3% (5/6) of steps completed at C-2, and 100% (6/6) of steps completed at C-3.

The criterion for receiving reinforcement was increased after Alan had demonstrated a stable rate of responding at the previous criterion. Changes in criterion were based upon a review of the data and the clinical judgment of the author.

Follow-Up

Upon completion of the training phase, Alan's teacher was advised to move gradually from a continuous, to a more intermittent schedule of reinforcement, during daily lunch meals. This change was accomplished by activating the light and music stimulation after every three to four successful feeding trials. Approximately 2 months later, Alan was moved back to the group feeding table and the light and music reinforcement were discontinued. Instead, intermittent teacher praise was the only reinforcement delivered. Subsequently, data collection procedures were reinstated for one meal that occurred 3, 4, and 12 months posttraining.

RESULTS

Figure 1 presents the average percentage of steps completed independently for the initial 20 feeding trials per daily lunch meal. During baseline Alan never grasped the spoon or attempted to feed himself upon the teacher's request. His performance during training was the gradual acquisition of self-feeding. As depicted in the figure, he completed independently those steps required at each criterion and did so *100% of the time*. Each time the criterion was advanced to include a larger percentage of steps in the self-feeding sequence, Alan responded accordingly. Independent performance of self-feeding was maintained at the 3-, 4-, and 12-month follow-up assessments.

DISCUSSION

Because the child in this case presented with a serious medical condition that necessitated the addition of nutrients to his food, it was mandatory that he consume his meals. Over the years his refusal to feed himself demanded that he be fed by another person, a situation that maintained dependency and produced agitation whenever efforts to establish self-initiated feeding were imposed. The program described in this report was effective in teaching self-feeding, and the skill continued to be

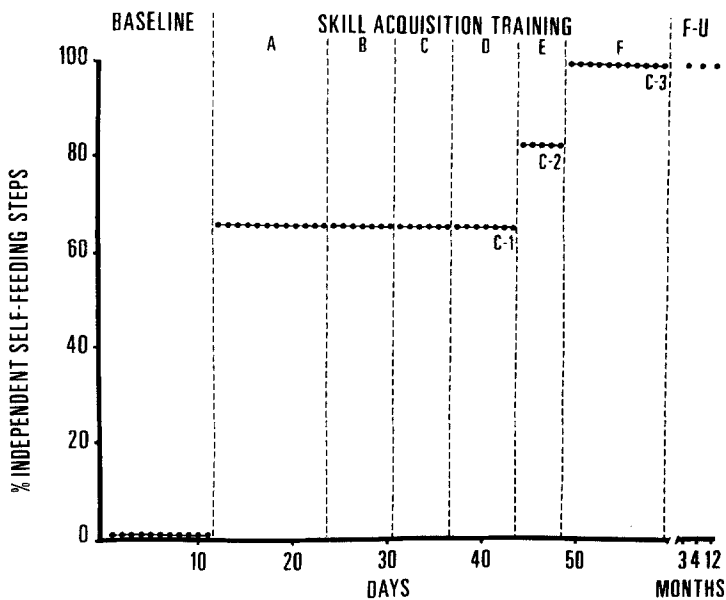


Fig. 1. Average percentage of self-feeding steps completed independently during daily lunch meals. Baseline and follow-up meals were conducted at a group table. Meals during Skill Acquisition Training phase were conducted within an individualized feeding area. Criteria for reinforcement are denoted by C-1, C-2, and C-3.

demonstrated up to one year posttraining. Effects were produced without causing distress to the child and the possible occurrence of food refusal.

Alan acquired the self-feeding skill "errorlessly." That is, he fulfilled each criterion step in the training sequence at 100% accuracy at every meal. There were two reasons that may account for this result. First, when asked to generate potential reinforcing stimuli, his teacher stated that, "He will do anything for music and light." Indeed, Alan was highly responsive when access to such stimulation was made available to him and during training, talked frequently about, "seeing lights and hearing music." Therefore, the program was able to incorporate two powerful sources of reinforcement. And second, each condition in the training program was sequenced into very small increments such that changes were introduced gradually and without excessive "demand." Because a graduated approach was utilized it enabled Alan to master prior steps completely before moving on to the next requirement.

Functional control of the training program was demonstrated using a changing criterion design. The purpose of this experimental methodology

is to show that a particular level of responding changes accordingly when the criterion for reinforcement is adjusted. In the present case, Alan received reinforcement for completing a specific number of steps independently, and this requirement was increased progressively over time. His percentage of independent responding consistently matched the imposed criterion for reinforcement, thereby isolating the controlling effects of the response-reinforcer contingency. A changing criterion design is particularly well suited to the evaluation of skill acquisition programs and those that incorporate behavior shaping methods.

During the course of classroom-based meal training Alan continued to be fed at home. Once he achieved independent performance and was able to maintain this skill for several months, his mother was provided in-home training by the teacher. Self-feeding was transferred rapidly to the home setting without the use of sensory reinforcement or extensive shaping procedures. It appeared that once Alan had acquired the complete self-feeding sequence, he was able to perform the skill at other meals.

Training with Alan initially was time-intensive and required a very individualized program. Upon conclusion of the study, however, he was easily integrated back to a group mealtime and, as demonstrated by follow-up data, was able to maintain independent self-feeding within this context. Most importantly, Alan's improvement was achieved without affecting food consumption and potentially compromising his health status.

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