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# *USING REINFORCER PAIRING AND FADING TO INCREASE THE MILK CONSUMPTION OF A PRESCHOOL CHILD*

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The present study replicates and extends previous research on the treatment of food selectivity by implementing pairing and fading procedures to increase a child's milk consumption during regularly scheduled preschool meals. The treatment involved mixing a small amount of chocolate syrup into a glass of milk and gradually eliminating the chocolate. The procedure and data collection were implemented by preschool teachers and resulted in increased milk drinking at school, which was maintained at home.

DESCRIPTORS: food selectivity, healthy eating behavior, liquid refusal, preschoolers, reinforcement pairing and fading

Parents are often challenged to ensure that their young children consume a sufficient quantity and variety of foods to meet their nutritional needs (e.g., vegetables and dairy products). Children who avoid particular classes of food are at risk for developing health-related problems later in life. For instance, inadequate calcium intake is associated with increased occurrence of osteoporosis, hypertension, obesity, and other health conditions (Nicklas, 2003). However, both boys and girls often fail to consume adequate levels of calcium (e.g., only 71% of girls and 62% of boys between 6 and 11 years old are reported to consume recommended levels). One major reason for these deficits may be that only 75% of children drink milk, which serves as a significant source of dietary calcium (Nicklas).

Several reinforcement-based interventions described in the treatment of severe feeding disorders may be applicable to the more common problems experienced by parents. One such treatment involves pairing a preferred food with a nonpreferred food, and then fading the preferred food. For example, Mueller, Piazza, Patel, Kelley, and Pruett (2004) treated the food selectivity of 2 children by blending a preferred food into a nonpreferred food. The ratio of preferred food to nonpreferred food was then progressively reduced (e.g., 10% nonpreferred /90% preferred to 20% nonpreferred/80% preferred). After this blending procedure, the participants accepted several initially refused foods.

A similar procedure was used by Patel, Piazza, Kelly, Ochsner, and Santana (2001) to increase the caloric intake of a young child with a severe feeding disorder. This procedure involved mixing gradually increasing amounts of a nonpreferred food (first Carnation Instant Breakfast® and then milk) with a larger amount of a preferred liquid (water) and then gradually fading the preferred liquid. After this treatment was concluded, the child accepted Carnation Instant Breakfast® in milk.

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Establishing children's healthy eating habits, such as regular milk drinking, at young ages may offer one proactive solution to potentially serious health problems later in life. Therefore, the purpose of the current study was to systematically replicate pairing and fading procedures, such as those described by Mueller et al. (2004) and Patel et al. (2001) with a typically developing child who refused milk. These procedures involved mixing a preferred substance (chocolate syrup) into a nonpreferred fluid (milk) and then gradually eliminating the chocolate syrup. This intervention was implemented by teachers in a preschool classroom during regularly scheduled mealtimes. Following this intervention, the child's parents measured milk consumption at home.

## METHOD

### *Participants and Setting*

Mark was a 4-year 10-month-old boy enrolled in a university-affiliated preschool that served 2.5- to 5.5-year-old children from the local community. Mark's parents expressed concern that he had been refusing milk for several months. They had attempted to provide soy milk as an alternative; this was also rejected. In the preschool, milk (and other food) was served twice each day during family-style breakfasts and lunches. During these meals a teacher sat at a table with 5 to 7 children who took turns serving themselves food from prepared platters. When serving beverages, a teacher filled a single pitcher of milk, and each child poured a cup from this pitcher in turn. For several months prior to this study, Mark had poured his milk from a separate pitcher (previously containing soy milk). This separate pitcher was used for Mark during the current study to permit precise measurement of milk consumption and inconspicuous reinforcer pairing.

### *Response Measurement*

The pitcher in which Mark's milk was served was marked in 2-oz increments. Therefore, milk consumption is reported in ounces rather than milliliters. Prior to each meal, a classroom teacher measured the volume of milk in the pitcher and then served the pitcher to Mark. At the conclusion of the meal (i.e., when Mark asked to be finished), any milk remaining in his cup was transferred back into the pitcher, and the amount of milk was measured again. The amount of milk present after the meal was subtracted from the amount present before the meal to determine the amount consumed. Session data were lost on 5 days when either Mark spilled his milk prior to the end of the meal or milk was served but classroom teachers forgot to collect data.

### *Interobserver Agreement*

During 44% of meals in the classroom, a second classroom teacher independently recorded the volume of milk both before and after the meal. To determine agreement between observers, the smaller measure was divided by the larger measure to yield a percentage agreement score. Agreement scores averaged 100% for the volume of milk before meals and 97% for the volume of milk after meals (range, 0% to 100%). Three meals were scored in disagreement, of which only one meal was highly discrepant (i.e., the primary observer recorded that 0 oz of milk remained and the reliability observer recorded that 4 oz of milk remained). During 25% of meals at home, both of Mark's parents independently recorded the volume of milk both before and after the meal. These records agreed 100% for measures collected both before and after the meal.

### *Procedure*

During baseline, Mark was provided with 4 oz of milk in a small pitcher by a teacher during the meal. The teacher then prompted Mark to pour his milk into his cup. No prompts to drink his milk were provided during any part of the study, nor were any differential social consequences arranged for either drinking

or not drinking milk. Pairing meals were identical, except that when preparing meals in the kitchen, a teacher mixed 5 ml of chocolate syrup (measured using an infant medicine syringe marked in 0.2-ml increments) into the pitcher of milk prior to serving it to Mark in the classroom. This mixture was agitated until the color was even. Chocolate syrup was used because his parents reported that Mark preferred chocolate and drank chocolate milk in the past. Prior to the initial pairing session, Mark was told that he was receiving chocolate milk that day and he could drink it if he wanted to. No other comments regarding the milk were made throughout the study. During fading, the amount of chocolate syrup mixed into the milk was progressively decreased by 0.2 ml every two meals. That is, the amount of syrup mixed was slowly decreased across 48 meals until plain milk was provided. At this time the condition was identical to baseline.

To ensure that treatment effects extended beyond preschool meals, Mark's parents were provided with a measuring pitcher and data sheets to measure his milk consumption at home following the pairing and fading intervention in the preschool. These meals were conducted similar to baseline meals at school except that the amount of milk provided during a single meal varied (i.e., Mark's parents tended to provide larger cups than the preschool did). Measurement of milk consumption was collected using the same procedures as at school. At the conclusion of the study, Mark's mother filled out a satisfaction survey including four questions related to (a) her concern regarding Mark's milk refusal during baseline, (b) the acceptability of the pairing and fading procedure, (c) the acceptability of the results of the pairing and fading procedure, and (d) the likelihood that she would recommend similar procedures to a friend. Each question was answered with a score from 1 (*very low concern, acceptability*, or *likelihood*) to 5 (*very high concern, acceptability*, or *likelihood*).

## RESULTS AND DISCUSSION

Results of the evaluation are presented in Figure 1. During baseline meals, Mark did not consume any milk. However, when chocolate syrup was added to his milk during pairing meals, he consumed the full serving during every meal. These results were replicated in a reversal design. After approximately 2 weeks of reinforcement pairing, fading was initiated (Session 32). During fading, Mark continued to consume the full serving of milk provided ($M$ = 4 oz). The fading schedule was completed at Session 80, after which Mark was drinking regular milk with no added syrup (i.e., identical to baseline conditions). Mark's milk consumption was variable at this point ($M$ = 3.4 oz), but remained elevated well above baseline levels (i.e., he drank some milk during every meal). On 2 days (noted by the broken $y$ axis), Mark requested second servings of milk, such that his consumption exceeded the typical 4 oz. Levels of milk consumption were variable during home meals ($M$ = 2.8 oz), but again, some milk was consumed during each meal, suggesting that the effects of the pairing and fading procedure extended across settings. In response to the satisfaction survey, Mark's mother reported substantial concern regarding Mark's milk rejection that occurred during baseline (4 on a scale of 5), that she found the pairing and fading procedure to be extremely acceptable (5 on a scale of 5), that the results of the procedure were extremely acceptable (5 on a scale of 5), and that she would be extremely likely to recommend the same procedures to a friend (5 on a scale of 5).

The present study systematically replicated the pairing and fading procedures described by Mueller et al. (2004) and Patel et al. (2001), and extended their application to a preschool classroom with a typically developing child. Prior to treatment, Mark refused all milk presented to him for several months. Following treatment, he typically consumed approximately 10 oz of milk per day (an average of 3.2 oz per

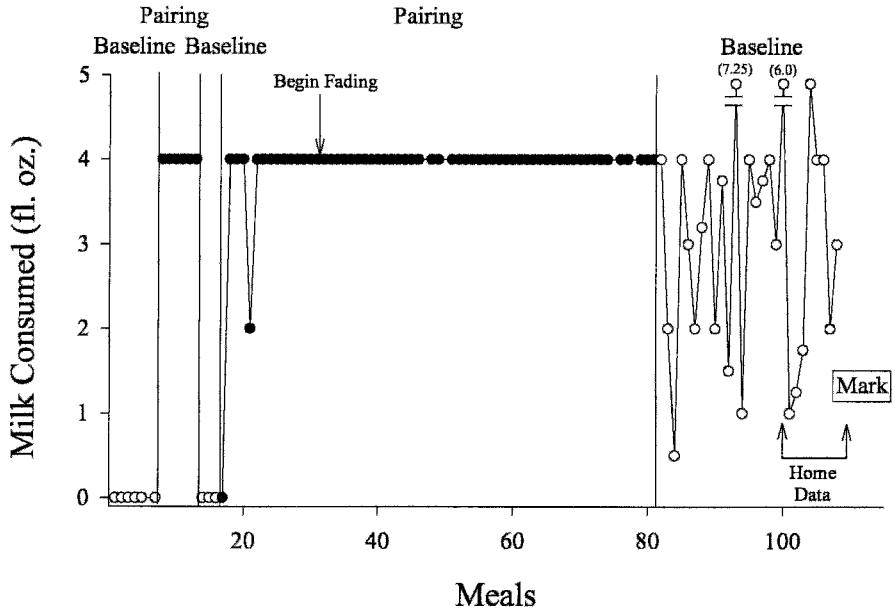


Figure 1. Milk consumption across baseline, pairing, and fading meals. Blank spaces indicate meals in which milk was provided, but either remaining milk was spilled prior to data collection or teachers forgot to collect data for a given meal.

meal during his three meals per day). Although his parents were completely satisfied with the change in milk consumption, the success of this intervention can also be measured against the American Heart Association's (2005) recommendations that children under the age of 8 years drink 2 cups (16 oz) of milk per day to meet their calcium requirements (i.e., the intervention increased Mark's milk consumption from 0% to 63% of the recommended daily intake). Although this increase was important, the final outcome was not ideal because additional supplementation was still needed. This could be achieved in at least two ways. First, data from the fading procedure suggest that higher levels of milk consumption could be maintained with the addition of as little as 0.2 ml of chocolate syrup. The caloric costs of a small amount of syrup are likely offset by the added benefit of additional milk consumption. Second, Mark's additional calcium needs were met by his consumption of other dairy products (e.g., yogurt and cheese) that were served regularly at school and at home.

Besides the application context, the procedures of the current study differed from those of Mueller et al. (2004) and Patel et al. (2001) in that treatment effects were obtained in the absence of escape extinction. That is, in previous research, the blended preferred and nonpreferred foods were presented until the bite or sip was accepted. The necessity of escape extinction is likely related to the initial aversiveness of the nonpreferred food. Mark's food refusal was presumably maintained by avoidance of some quality of the milk (e.g., taste, texture, or color) that was initially altered by the addition of chocolate. However, in cases that involve medical or biological complications (e.g., gastroesophageal reflux), the aversive aspects of food acceptance may not be as easily overcome.

One possible limitation of the current study is that fading may have progressed unnecessarily slowly. That is, the volume of chocolate syrup could have been faded more rapidly. This possibility was not examined in the present study, but future research could include periodic baseline probes during fading to

determine points at which additional fading steps are unnecessary.

Parents are often challenged to teach their children to make healthy meal and snack choices. The present study provides one example of how an intervention developed for clinical use may be applied to the more common instances of feeding problems experienced by typical young children. Future research should evaluate the use of other clinically originated treatments for feeding problems with more common cases of food refusal (e.g., differential reinforcement of acceptance; Piazza et al., 2002).

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