ACHIEVING AND MAINTAINING COMPLIANCE WITH THE KETOGENIC DIET

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The ketogenic diet, a treatment for intractable epilepsy, is rarely initiated because it requires strict compliance with a diet that is perceived to be unpalatable. In a case study of a 15-year-old girl with uncontrolled epilepsy, we used a stimulus-choice procedure to assess relative preferences of 33 foods from the diet and to develop two treatments based on Premack's principle. The results of a multielement analysis showed that both treatments increased dietary compliance. Compliance was maintained with generalization of treatment across settings, and was associated with a 40% reduction in seizures.

DESCRIPTORS: ketogenic diet, epilepsy, diet compliance, Premack's principle, behavioral pediatrics, preferences

The ketogenic diet can effectively treat some cases of intractable epilepsy, but it is rarely used because physicians and caregivers view the diet as unpalatable and assume that compliance will be low (Kinsman, Vining, Quaskey, Mellits, & Freeman, 1992). Strict adherence to restrictions on types and amounts of food that can be consumed is essential, because even minor deviations (e.g., sugar in toothpaste) can compromise treatment efficacy. In this case study of a 15-year-old girl with uncontrolled epilepsy, we used a stimulus-choice procedure (Fisher et al., 1992) to assess relative preferences of 33 food items from the diet. We then (a) compared the results from the stimulus-choice assessment with predictions about food preferences made by caregivers and (b) developed and compared two treatments based on Premack's principle (Premack, 1962), wherein higher preference ketogenic foods were presented contingent upon consumption of lower preference foods. The case adds to the growing body of literature on using operant methods to improve compliance with medical treatments (Christophersen, 1994).

METHOD: Tasha, a 15-year-old female with severe retardation, was hospitalized for the treatment of aggression and a seizure disorder that was not adequately controlled with anticonvulsants. Tasha's caregivers were given a list of 33 ketogenic foods and asked to rank Tasha's preferences for these items. Next, we directly assessed Tasha's preferences for these foods by using the stimulus-choice procedure described by Fisher et al. (1992). During each trial, we presented Tasha with two food items from the diet. She chose one item from each pair and then consumed the selected item. An observer recorded her choice during each trial. We presented each item 32 times, once with every other item, for a total of 528 trials. Items were then ranked according to the percentage of trials in which Tasha selected a particular food. Interobserver agreement data were collected during 57.1% of the trials. Occurrence and nonoccurrence agreement coefficients averaged 91.3% and 94.6%, respectively.

Assessment results were used to develop two treatments based on Premack's (1962) principle. In baseline, we provided Tasha with free access to all ketogenic foods presented during a given meal. In Treatment A, we gave her a bite-sized amount of one of her three most preferred ketogenic foods (bacon, egg, American cheese) after she had completely consumed one of the other foods presented as part of the meal (e.g., a piece of bacon after eating 4 ounces of mayonnaise). We allowed Tasha to select the order in which she ate the less preferred foods. Treatment B was identical to Treatment A, except that we required that Tasha eat the foods in order from least to most preferred. Again, bite-sized portions of the most highly preferred foods were provided contingent upon consumption of each food item. We arranged the foods in order of preference because we believed consumption of the less preferred foods would decline during the meal due to satiation. A multielement design was used to compare the three conditions. Initially, we randomized conditions across meals. Then, to lessen the possibility of carryover effects, we randomized conditions across days. We measured the amount of food consumed by weighing the food, plates, and dishes before and after each meal. Reliability was assessed during 31.4% of meals by repeating each weighing and dividing the lower value by the higher value and multiplying by 100%. Reliability averaged 95.8%.

RESULTS AND DISCUSSION: As depicted in the top panel of the figure, Tasha's preferences for ketogenic food items, as measured by the stimulus-choice assessment, were markedly different from caregivers' predictions. The correlation between the caregivers' predictions and the stimulus-choice assessment was statistically significant but low ($r = .34$, $p = .05$). The bottom panel of the figure shows the amount of food consumed (i.e., dietary compliance) during baseline and the two treatment conditions. Average amount consumed was 60% during baseline, 97% during Treatment A, and 100% during Treatment B. Based on these results, we implemented the less restrictive intervention (Treatment A) and successfully generalized the treatment across multiple caregivers in a variety of settings, such as a group table, hospital cafeteria, picnics, and fast-food restaurants. Compliance averaged 99% for the 135 meals in which these generalization data were taken. During this period, the average number of seizures was reduced by 40% from baseline (prior to the diet), as recorded daily by both nursing and direct care staff.

Results suggest that a formal stimulus-choice assessment may be useful for developing behavioral treatments aimed at increasing dietary compliance with the ketogenic diet. In this case, the ketogenic foods that we identified in the stimulus-choice assessment were consumed consistently and also functioned as reinforcers when presented contingent upon consumption of less preferred foods. Given the low level of agreement between caregivers' predictions and the results of the stimulus-choice assessment, it is unlikely that a treatment based solely on input from caregivers would have been as successful.

The two treatments compared in this study were based on Premack's (1962) principle (i.e., higher preference foods were presented contingent upon consumption of lower preference foods). The only difference between the treatments was that Tasha could choose the order in which she consumed lower preference foods in Treatment A; to avoid the effects of satiation, she was required to eat the foods in order from least to most preferred in Treatment B. However, both treatments were highly effective, suggesting that satiation

had little effect on the reinforcing properties of the highly preferred foods. These results suggest that compliance with the ketogenic diet may be more easily achieved and maintained than previously thought when a combination of the stimulus-choice assessment and Premack's principle is implemented. These results, along with future research, may aid caregivers, pediatricians, and neurologists in deciding upon medical treatment options for clients with intractable epilepsy.

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