

*DISPLACEMENT OF LEISURE REINFORCERS BY
FOOD DURING PREFERENCE ASSESSMENTS*

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Identification of reinforcers for individuals with developmental disabilities is often based on the outcome of preference assessments in which participants make selections from among a variety of items. We determined the extent to which individuals might show a general preference for food items over leisure items during such assessments and whether leisure items that are "displaced" by food items might nevertheless function as reinforcers. Arrays consisting of food items only and then nonfood items only were presented separately to 14 participants and then were ranked to determine preference. The top selections from these initial assessments were subsequently combined in a third assessment, and preferences were again established. All but 2 participants showed a general preference for food items, such that selection of nonfood items in the combined arrays was displaced downward relative to selection of nonfoods in the nonfood-only arrays. Two of the participants were exposed to a condition in which a nonfood item was delivered contingent on the occurrence of an adaptive response, and increased rates of responding by both individuals were observed. Results are discussed in terms of limitations posed by using only food items as reinforcers and the resulting need to take precautionary measures when attempting to identify nonfood reinforcers.

DESCRIPTORS: choice, preference, stimulus preference assessment

Methods for identifying reinforcers for persons with developmental disabilities are often based on the outcome of preference assessments, during which individuals make repeated selections from among a variety of items whose composition includes both food and nonfood (e.g., leisure) items (e.g., Fisher et al., 1992; Paclawskyj & Vollmer, 1995; Windsor, Piche, & Locke, 1994). Casual inspection of data from some studies suggests that food items may be selected disproportionately more often than nonfood items. For example, Pace, Ivancic, Edwards, Iwata, and Page (1985) presented 6 participants with 16 items one at a time over 10 trials

each and assessed preference by measuring whether individuals approached each item when it was presented. Food items were selected more than or as often as the nonfood items by 4 of the 6 participants. Similarly, Smith, Iwata, and Shore (1995) presented 14 items to 4 participants using the Pace et al. procedure. Only one food item was available, and it was chosen on 100% of the trials by all 4 participants.

Although the purpose of these studies was not to examine relative preference between classes of reinforcers, the results suggested that individuals with severe disabilities may have a general preference for food items relative to nonfood items. If so, one determinant of choice in the context of preference assessments may be the pool of items from which selections are made, or the extent to which food items are intermixed with nonfood items. If food is generally preferred, then the reinforcing potential of nonfood items may be obscured during preference as-

This investigation was supported in part by a grant from the Florida Department of Children and Families. We thank Juliet Burke, Han-Leong Goh, SungWoo Kahng, Jana Lindberg, Theresa Sorenson, and Michele Wallace for conducting various aspects of the study.

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assessments simply because nonfood items do not compete well with food items.

In the present study, we sought to determine (a) the extent to which individuals with developmental disabilities preferred food items over leisure items, and (b) whether leisure items that are “displaced” by food items might nevertheless function as reinforcers.

METHOD

Participants, Settings, and Materials

Fourteen individuals participated in the study. All but one had been diagnosed with profound mental retardation; the exception was Eliza, who had been diagnosed with moderate mental retardation. All lived in a public residential facility for persons with developmental disabilities and had been referred to a day clinic for the treatment of self-injurious behavior. Sessions were conducted in one of the rooms of the clinic. Two participants had visual impairments. Chuck had myopia, and Eddie had no vision in his right eye, but both individuals had adequate vision to function without the aid of corrective lenses or other assistive devices. For each participant, 14 stimuli were initially selected for assessment. Seven stimuli were selected arbitrarily from a list that included sweet, salty, bitter, and sour foods. The other seven stimuli were selected either arbitrarily from a list of leisure items that included stimuli primarily affecting visual, auditory, tactile, or olfactory sensory modalities, or based on staff opinions about participants’ preferred leisure items.

Procedure and Experimental Design

Stimulus preference assessments. All participants were exposed to three preference assessments, each conducted over five sessions. During each assessment, seven items were presented in a multiple-stimulus format (DeLeon & Iwata, 1996). All sessions began

with the participant and an experimenter seated in adjacent chairs at a table. After placing all of the items in an array in front of the participant, the experimenter asked the participant to choose one item. The participant was allowed to consume one piece of the food selection (e.g., one pretzel) or to have access to the leisure item selection for 30 s. Selected items were not replaced in the array. The session continued until all items had been selected or a 30-s period had elapsed with no selections. The primary measure was a percentage reflecting the number of times an item was selected, divided by the number of times that item was available during the five sessions, and multiplied by 100%. Items were subsequently ranked according to selection percentages.

In one assessment (food assessment), the stimulus array consisted of food items only; in another assessment (leisure assessment), the array consisted of nonfood items only. Some individuals were exposed to the food assessment first, whereas others were exposed to the leisure assessment first. Following the completion of the separate food and leisure assessments, the top-ranked stimuli from both assessments were combined into a third array composed of both food and leisure items. The combined array typically consisted of the top three items from the first assessment and the top four items from the second assessment unless fewer than the requisite number of items had been selected during the initial assessments. In such cases, the combined array consisted of all of the items selected from one assessment (the array that failed to reach the three- or four-item criterion) and as many items from the other assessment as needed to complete a seven-item combined array.

Reinforcer assessment. With 2 participants, Sheila and Alex, we attempted to determine whether a leisure item (Connect Four® toy in both cases) that was ranked below at least three food items in the combined (third) as-

assessment would function effectively as a reinforcer for an adaptive response. For both participants, this item was ranked fourth in the combined assessment but ranked first in the leisure assessment. In the combined assessments, Sheila and Alex selected this toy on 23.8% and 22.7% of the trials, respectively, during which it was available. Sheila engaged in a high frequency of hand mouthing; therefore, drying her hands, defined as taking a towel from the experimenter and wiping either hand with it, was selected as her target response. Alex's target response, towel folding, was selected from those listed as habilitation goals in his service plan. For the purpose of the present study, Alex's response involved only the final step of a task analysis and was defined as taking a folded towel from the table and placing it into a basket.

All sessions lasted 5 min, corrected for access to the stimuli. That is, the experimenter kept track of total session time on a handheld timer, stopped the timer upon delivery the leisure item, and restarted the timer when the item was removed. The experimenter verbally prompted the participant to emit the target response at the beginning of each session (e.g., "Sheila, wipe your hands") and at 1-min intervals throughout the session. During baseline, each occurrence of the target response resulted in praise from the experimenter (e.g., "Thanks for wiping your hands, Sheila"). During the reinforcement condition, each occurrence of the response resulted in 30 s of access to the Connect Four®. Baseline (A) and reinforcement (B) conditions were presented in a reversal design (ABAB), and the dependent measure of interest was the frequency of responses (per minute) during each condition.

Data Collection and Interobserver Agreement

During the stimulus preference assessments, trained graduate and undergraduate student observers recorded the order of item selection using data sheets that were specif-

ically designed for this purpose. During 36.2% of the assessment sessions, an independent observer recorded the order of selections to assess interobserver agreement. When comparing observers' records, an agreement was scored if both observers recorded the same order of selection for each item. Interobserver agreement was calculated by dividing the number of selections on which observers agreed by the total number of selections and multiplying by 100%. All agreement scores were 100%.

During the reinforcer assessments, the same observers collected data using a handheld computer (Assistant, Model A102). Observers recorded the occurrence of prompts, adaptive responses, and reinforcer deliveries. Data were collected by a second observer during 32.8% of the sessions. When comparing observers' records, session time was divided into 10-s intervals. Interobserver agreement was calculated on an interval-by-interval basis by dividing the smaller number of recorded events by the larger number. These quotients were then summed across intervals, divided by the total number of intervals in the session, and multiplied by 100%. Mean interobserver agreement was 97.3% (range, 80.0% to 100%) for prompts, 95.2% (range, 78.3% to 100%) for adaptive responses, and 95.1% (range, 88.3% to 100%) for reinforcer delivery.

RESULTS

Table 1 shows the selection rankings obtained for the food and leisure items during the combined assessment for each participant. For 12 of 14 participants (85.7%), the most frequently selected (i.e., highest ranked) item was a food. For 11 of 14 participants (78.6%), the two most frequently selected items were foods. For 9 of the 13 participants (69.2%) whose combined arrays included at least three food items, the three most frequently selected items were foods.

Table 1
Rankings of Food and Leisure Items for the Combined
Stimulus Preference Assessment for Each Participant

Participant	Food item ranks	Leisure item ranks
Chuck	1, 2, 3, 4, 5	6, 7
Jim	1, 2, 3, 4	5, 6, 7
Alex	1, 2, 3, 5	4, 6, 7
Sheila	1, 2, 3	4, 5, 6, 7
Robbie	1, 2, 3	4, 5, 6, 7
Dina	1, 2, 3	4, 5, 6, 7
Janet	1, 2, 3	4, 5, 6, 7
Rod	1, 2, 3	4, 5.5, 5.5, 7
Charlene	1, 2, 3.5, 3.5	5, 6, 7
Reggie	1.5, 1.5, 4	3, 5, 6, 7
Rudy	1, 3, 4	2, 5, 6, 7
Carly	1, 2, 6	3, 4, 5, 7
Eliza	2, 4, 5, 7	1, 3, 6
Eddie	2, 3.5, 6, 6, 6	1, 3.5

Finally, for 8 of the 14 participants (57.1%), the lowest ranked food was selected more often than the highest ranked leisure item.

Figure 1 shows the selection percentages for leisure items during the leisure assessment and during the combined assessment. Of the 48 leisure items tested in the combined arrays, 45 (93.7%) were selected on a lower percentage of trials during the combined assessment relative to the leisure assessment. Only the fourth-ranked item for Carly, the second-ranked item for Eliza, and the highest ranked item for Eddie were selected more often during the combined assessment. In addition, 45 of the 48 leisure items (93.7%) received lower rankings during the combined assessment relative to the leisure assessment. These included the same items described above for Carly and Eddie and the highest ranked item for Eliza.

Spearman rank-order correlations were calculated between rankings for leisure items from the leisure assessment and rankings for the same items when included in the combined assessment (not including the foods) to assess participants' consistency across the two assessments. For example, if items ranked first, second, third, and fourth in the leisure assessment were ranked fourth, fifth, sixth, and seventh, respectively, in the combined as-

essment by a given participant, ranking consistency was retained even though the leisure items were displaced by food. This analysis yielded a mean rank-order correlation of .692 (range, $-.389$ to 1.00). With the exception of Rod, all correlations were positive and higher than .50 (the mean correlation excluding Rod was .776).

Figure 2 shows the selection percentages for foods during the food assessment and during the combined assessment. Only 23 of the 50 foods (46.0%) were selected on a lower percentage of trials during the combined assessment relative to the food assessment. In terms of rank comparisons, 20 of the 50 food items (40.0%) received lower rankings during the combined assessment relative to the food assessment, whereas 16 (32.0%) resulted in higher rankings. The remaining 14 food items (28.0%) retained the same ranking across assessments.

Spearman rank-order correlations across food and combined assessments for the food items yielded a mean coefficient of .335 (range, $-.949$ to 1.00), indicating that, relative to the leisure items, the ranking of foods was less consistent across the two assessments. However, this also suggests that the displacement found among food items, whether upward or downward in terms of rank, was a function of displacement by other food items rather than downward displacement by the leisure items.

Figure 3 shows the results of the reinforcer assessments for Sheila and Alex. During baseline, Sheila displayed a low, steady rate of hand drying. During the first reinforcement condition (FR 1, Connect Four[®]), her responding was more variable but showed a substantial increase over that observed during baseline. Sheila's responding decreased during the return to baseline and increased again during the final reinforcement condition. Alex's rate of placing towels in the basket showed a slight and gradual increasing trend during the initial baseline. An accel-

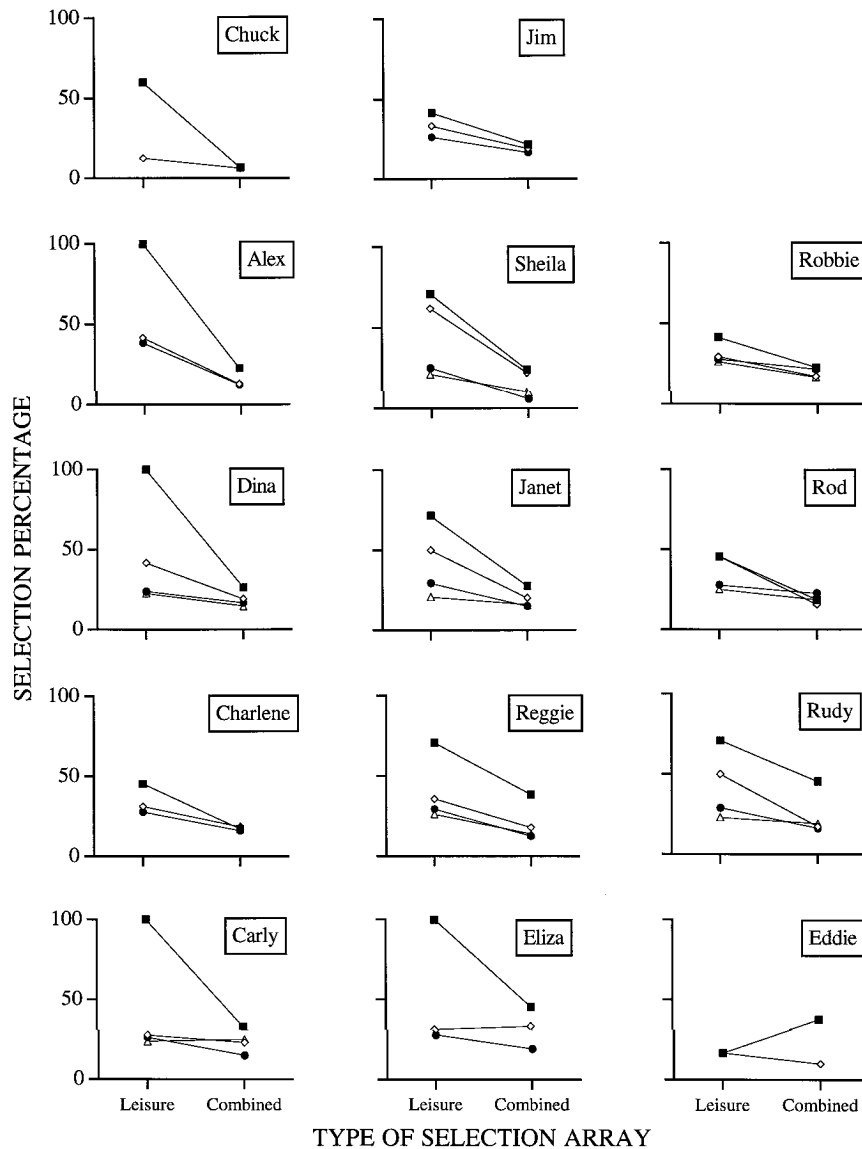


Figure 1. Selection percentages for leisure items during the leisure assessment and during the combined (leisure and food) assessment. Connected data points represent the same items included in both assessments.

erated increase in responding was observed during the first reinforcement condition, followed by an immediate decrease during the return to baseline and another increase during the final reinforcement condition.

DISCUSSION

After obtaining distinct rankings for stimuli during preference assessments when food

and leisure items were presented separately to 14 individuals with developmental disabilities, we observed that a large majority of participants later showed a strong preference for food when food and leisure items were combined in the same assessment. That is, food items readily displaced leisure items in the combined assessment, even though the leisure items were highly preferred in the absence of food. As a result, selection of lei-

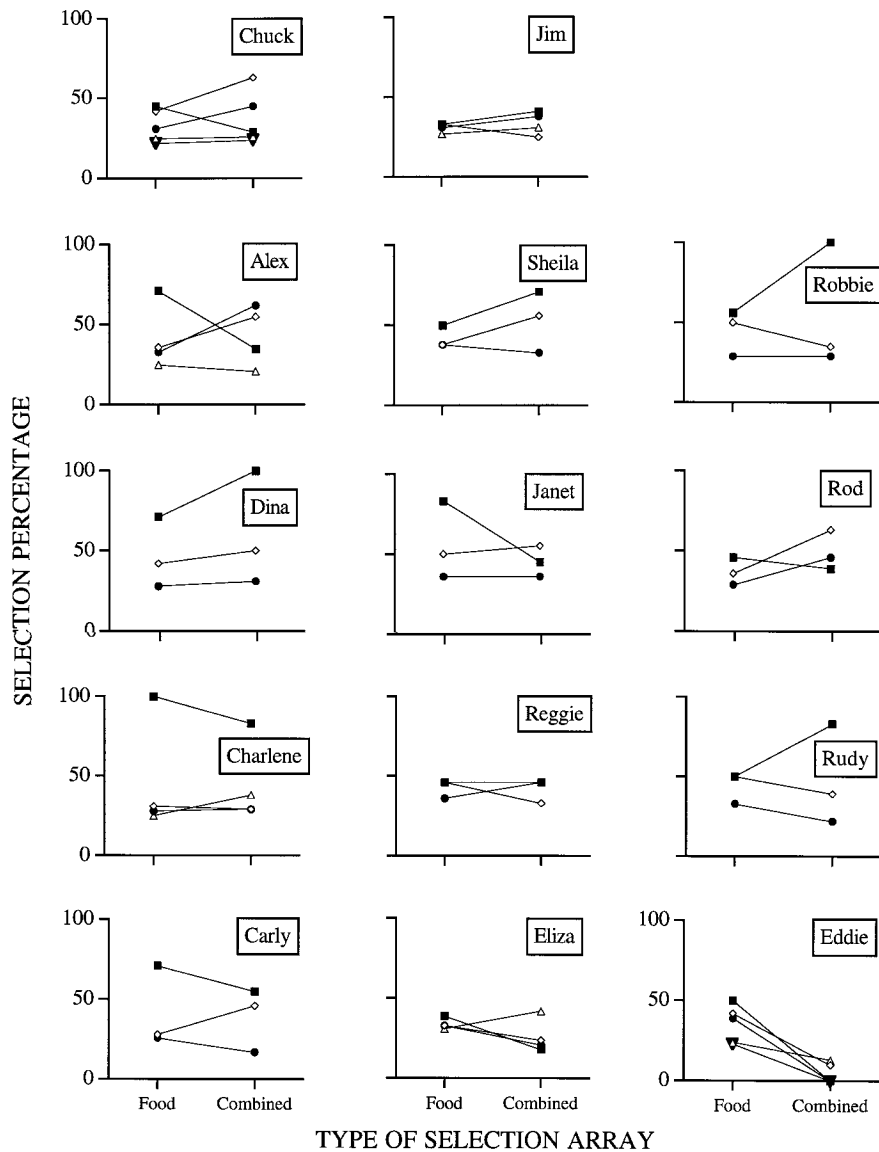


Figure 2. Selection percentages for food items during the food assessment and during the combined (leisure and food) assessment. Connected data points represent the same items included in both assessments.

sure items was generally low during the combined assessment. The fact that displaced leisure items did serve as reinforcers for 2 participants' adaptive responding suggests that when food and leisure items are combined in stimulus preference assessments, the resulting outcomes for leisure items may represent false negatives. That is, if only the combined assessment had been conducted, a likely prediction would have

been that the leisure items were not very effective reinforcers because of their relatively low selection percentages and subsequent rankings. The extent to which items that are ranked low in preference assessments function effectively as reinforcers is largely unknown. Although Piazza, Fisher, Hagopian, Bowman, and Toole (1996) found that items from the middle of a ranking maintained higher levels of responding than did items

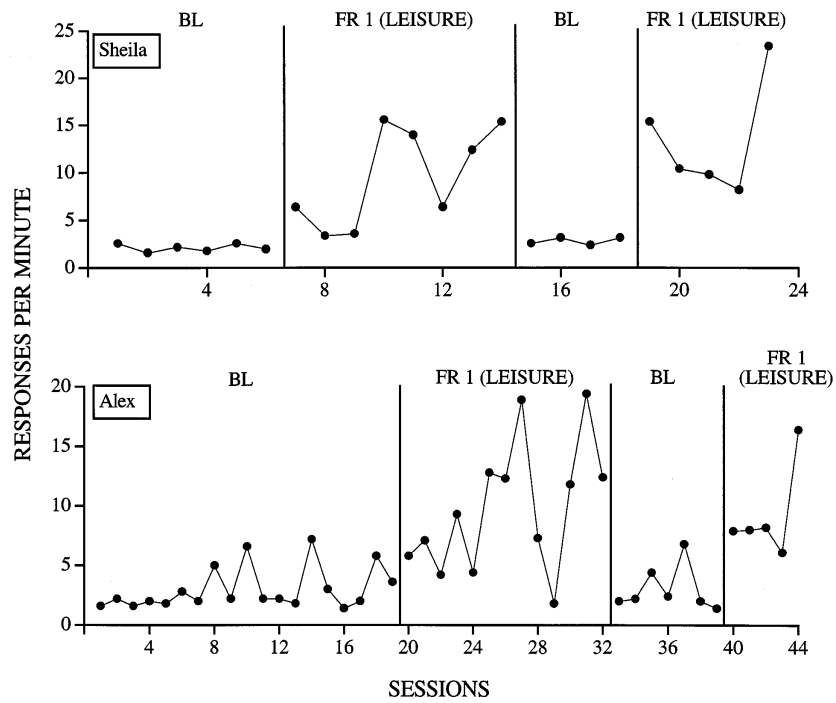


Figure 3. Number of responses per minute of adaptive behavior emitted by Sheila (top panel) and Alex (bottom panel) during baseline (BL) and during a condition in which responses produced access to a leisure item on an FR 1 schedule of reinforcement.

from the bottom of a ranking, it is probably more common in actual practice to select only the top few items for use as reinforcers. If so, the present results suggest that the reinforcing effects of some leisure items would have been masked by the presence of food in the selection arrays.

To the extent that these data are generalizable, the displacement effect observed here would influence the results of any preference assessment in which foods and leisure items are assessed together and in which stimuli are presented more than one at a time. For example, DeLeon and Iwata (1996) reported that food items tended to be the higher ranked items when preference was assessed using both the multiple-stimulus format described in this study and the paired-stimulus format (Fisher et al., 1992) in which stimuli are presented two at a time. The only format for which selective preference for one class of reinforcers would not affect results ob-

tained for other classes of reinforcers is one in which stimuli are presented singly (Pace et al., 1985).

Several explanations may account for our participants' general preference for food over nonfood reinforcers. For example, it is possible that the response effort in extracting reinforcement from food is less than that for nonfood reinforcers. Alternatively, the observed preference for food may have reflected the effects of establishing operations (Michael, 1982). That is, if participants were somewhat food deprived during the assessments, their motivation to obtain food might have been generally, but only temporarily, higher than that to obtain leisure items. However, inspection of individual data revealed no differences in preference for food versus leisure items as a function of meal times relative to assessment times during the day. In future studies, relative levels of deprivation or satiation to both food and

leisure items might be manipulated systematically to determine the influence of establishing operations on the results of preference assessments. It is certain that some amount of deprivation or satiation will strengthen or weaken reinforcement effects (Corte, Wolf, & Locke, 1971; Vollmer & Iwata, 1991), but whether events such as meals, recreational activities, or work would exert a disruptive influence during the brief exposures to stimuli that are typically used during preference assessments is unknown.

Results obtained in this study showed that food was a highly preferred stimulus and are consistent with results from an extensive body of research demonstrating that food can be an effective reinforcer for establishing and maintaining a variety of adaptive behaviors as well as for reducing the frequency of behavior problems. However, food items, as a class, may present some disadvantages relative to nonfood items. Rincover, Newsom, Lovaas, and Koegel (1977) noted that food is not often used as a reinforcer in many naturalistic situations. There are also some concerns over the motivational properties of food reinforcers. Rincover and Newsom (1985) observed that participants tended to satiate more quickly to food reinforcers than to sensory reinforcers and concluded that food may function inconsistently as a reinforcer because of ethical and legal standards related to food deprivation. By contrast, fewer concerns seem to be expressed for withholding leisure items, and research has indicated that their reinforcing effects can be enhanced through the manipulation of establishing operations (Vollmer & Iwata, 1991). Additional problems may stem from the fact that the delivery of food reinforcement may not occasion very much caregiver–client interaction (Rincover & Newsom) and that relatively little behavior is required to extract reinforcement once the item has been earned. By contrast, engagement with many leisure reinforcers requires participa-

tion in social activities with others or, alternatively, extended durations or sequences of behavior involving item manipulation. These factors may be most critical in the suppression of behavior problems that is due to behavioral competition; that is, engaging in appropriate social interaction or solitary leisure activity occupies time that might otherwise be spent engaging in the problem behavior. Finally, Rincover and Newsom pointed out that extensive use of food reinforcers may expose individuals to health and dental risks.

For these reasons, effective nonfood reinforcers may be especially important in the training and treatment of individuals with developmental disabilities, and the present results indicate that special precautions may need to be taken when attempting to identify such reinforcers. Specifically, single-stimulus presentation may be required initially, or, if stimuli are presented in pairs or groups, nonfood items may need to be assessed separately. If, under these conditions, little preference is observed for leisure items, then specific training may be required to establish object manipulation as a reinforcing activity *per se* (Singh & Millichamp, 1987). Perhaps if individuals were better skilled in extracting appropriate reinforcement from a subset of leisure items, they might show greater preference for such items during an assessment, even though they may have had little experience with the specific stimuli being presented. For example, it would be interesting to determine whether, after training is provided with selected leisure items, preference for these or other leisure items increases relative to that observed for food reinforcers.

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Received March 20, 1997
 Initial editorial decision April 16, 1997
 Final acceptance May 15, 1997
 Action Editor, Cathleen C. Piazza

STUDY QUESTIONS

1. What observation by the authors suggested that results obtained from stimulus preference procedures might produce faulty predictions about the reinforcing effects of leisure items?
2. What was the purpose of conducting three different preference assessments, and how was this accomplished?
3. On what basis were stimuli selected for use in the reinforcer assessments for Shiela and Alex?
4. In what way did the formula for calculating interobserver agreement differ from the more typically used “total” or “exact” agreement formulae?
5. Describe the general pattern of responding observed during the combined preference assessment. Also, what was shown by the correlations between rankings for leisure items from the leisure item assessment and rankings for the same items during the combined assessment?
6. What results were obtained during the reinforcer assessment?

7. What are some disadvantages associated with the use of food reinforcers? Although not mentioned by the authors, what are some of the advantages of food?

8. Given the results of the study, what strategies did the authors recommend when attempting to identify nonfood reinforcers?

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