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Teaching Object-Picture Matching to Improve Concordance between Object and Picture Preferences for Individuals with Developmental Disabilities: Pilot Study

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Abstract

We evaluated teaching object-picture matching to improve concordance between preference assessments using objects and pictures of the same objects. Three participants with developmental disabilities who showed high and low preferences during assessments with objects but not with pictures were taught object-picture matching tasks unrelated to the items used during preference assessments. Training was evaluated in a modified multiple-baseline design and preference assessments with objects and pictures were repeated after training each object-picture matching task. Two participants showed improved concordance after mastering two and three training tasks, respectively. The third participant did not show concordance between object and picture preference assessments after mastering two tasks and after additional training. Our findings suggested that object-picture matching might be a prerequisite for picture preference assessments.

Assessing the preferences of individuals with developmental disabilities and arranging the environment to provide their preferred items is one way of implementing the concept of self-determination to enhance life quality (Baer, 1998). In preference assessments, choices are typically presented in object, pictorial, or spoken form (Conyers et al., 2002). In the object mode, the items themselves are shown during the assessment; in the picture mode, pictures of the items are shown; and in the spoken mode, the items are described (named) during the assessment. Several studies have shown that discrimination abilities correlate with consistent responding in these modes. For example, Conyers et al. used the *Assessment of Basic Learning Abilities* (ABLA, Kerr, Meyerson, & Flora, 1977) that assesses an individual's ability to learn basic visual and auditory discriminations. They found that persons who had demonstrated auditory-visual discrimination (placing a white foam into either a red box or a yellow can when verbally asked to do so) could select their preferred items when the choices were presented in all three modes; persons who had demonstrated matching-to-sample discrimination (placing a red cube into a red box or a yellow cylinder into a yellow can) could select their preferred items when the choices were objects or pictures, but not when they were spoken; and persons who had demonstrated simple visual discrimination (placing a foam into a yellow can regardless of its position relative to the red box) only could select their preferred items when the choices were objects and not when they were pictures or spoken (see Martin & Yu, 2000, in this journal, for a more detailed description of the ABLA). Similar results have been found with food and non-food items (Conyers et al.), leisure activities (de Vries et al., 2005; Lee, Nguyen, Yu, Thorsteinsson, & Martin, 2008), and work related tasks (Reyer & Sturmey, 2006).

Recently, Clevenger and Graff (2005) found that three individuals with developmental disabilities who showed similar preferences with objects and pictures assessments were able to perform picture-to-object and object-to-picture matching. In contrast, another three participants who did not show preference concordance between object and picture assessments were unable to perform picture-to-object and object-to-picture matching. The authors suggested that matching object to picture (objects as sample and pictures as comparisons), and its reverse relation (i.e., pictures as sample and objects as comparisons), might be important prerequisites for picture preference assessments.

Matching-to-sample skills and picture preference assessment ability have been shown to correlate positively. In this study we examined whether their relation is functional. We hypothesized that individuals who showed differential preferences during assessments with objects, but not with pictures of the same objects, would improve their concordance between the two modes after being taught object-picture conditional discriminations. If the relation is functional, the findings will have important implications for teaching persons with developmental disabilities to show preferences using picture preference assessments.

Method

Participants and Settings

Three individuals with developmental disability participated. Participant 1 was a 9-year-old boy who was diagnosed with autism. His composite score on the *Pervasive Developmental Disorder Behaviour Inventory* (Cohen & Sudhalter, 2005) was slightly above the mean of (more severe than) the average child with autism. His maladaptive index and support score on the *Scales of Independent Behaviour-Revised* (Bruininks, Woodcock, Weatherman, & Hill, 1996) fell within the "serious range" and "pervasive level of support," respectively. Participant 2 was a 34-year-old man diagnosed with profound developmental disabilities. Participant 3 was a 34-year-old man diagnosed with autism. All participants had no speech and did not use any augmentative communication devices. Sessions took place in a quiet area. The participant sat in a chair, behind a table, across from the experimenter. During some sessions, an observer was present to conduct reliability checks.

Design

A multiple-baseline design, with multiple-probe technique, across tasks was used (Hersen & Barlow, 1976; Horner & Baer, 1978). This is a single-subject research design in which each participant serves as his/her own control and the effectiveness of an intervention is demonstrated through successive replications across typically three times series (three tasks in this study). If behaviour change is observed only after the intervention has been introduced for each task, one can attribute the observed change to the intervention. Replication of the intervention effects across several participants further strengthens the conclusion that the observed change is due to the intervention rather than extraneous variables. Thus, the single-subject research design can provide a convincing demonstration of the internal validity of an intervention (i.e., whether the intervention is responsible for the observed results) with only a few participants and is highly suited for this type of training studies.

Procedures

Object preference assessment. At the beginning of the study, each participant completed a paired-stimulus preference assessment (Fisher et al., 1992) involving an array of 10 items until two high- and two low- preference objects had been identified. In this assessment, items were presented in pairs on each trial in a random order, and each item was paired with every other item at least twice, in counterbalanced positions, such that each item was presented on the left and right an equal number of times.

At the beginning of each trial, the participant was prompted to look at each object and was then asked to "pick one." A rejection response was defined as pushing an item away. An approach response was defined as pointing to, reaching for, touching or taking an item, without rejecting it. An approach response could occur following a rejection of the alternative on the same trial. Following a selection, the item was given to the participant for consumption if it were a food item, or for approximately 15 seconds if it were an activity, and the participant was praised for attending and cooperating. If the participant rejected both items in succession, the trial would end. If no response occurred after approximately 8 seconds, the trial would end and the next trial would be presented. The participant's approach and rejection responses were recorded on each trial. Each session lasted approximately 30 minutes. A high preference item was defined as having been selected on approximately 80% of the trials. A low preference item was defined as having been selected on no more than 50% of the trials.

Interspersed picture and object preference assessment. Following the object assessment, the two most and two least preferred objects were used in an interspersed object and picture assessment. The interspersed assessment procedure differed from the object preference assessment described above in three ways. First, only the four items identified above were presented during the assessment. Second, objects and color photographs (20 $\times$ 25 cm) of the objects were presented on alternate trials. Third, assessments were conducted until four unique stimulus pairings, each consisting of only a high- and low-preference stimulus, had been presented four times in each mode and the positions of the stimuli were counterbalanced (total of 16 trials per mode). Table 1 shows the items identified for each participant. The interspersed picture and object preference assessment was completed before training, and was repeated throughout the study after each object-picture matching task was trained (described below), and at follow-up.

Baseline of training tasks. Three pairs of food or activity stimuli were identified for training for each participant (see Table 1). The stimuli were selected from everyday food items, objects, toys, or academic materials. Color photographs (20 $\times$ 25 cm) of the objects were prepared and the participants were asked to match objects (samples) to pictures (comparisons) during the assessment. Each pair of tasks was assessed separately using the procedure described below.

During each trial, two pictures were placed on the table in front of and at an equal distance to the participant. The participant was prompted to look at each picture. Then an object depicted in one of the pictures was held at the participant's eye level, and the participant was asked to pick

Table 1. High and low preference objects and training tasks

	Preferred Objects		*Training Tasks*		
Participant	*High*	*Low*	*1*	*2*	*3*
1	Cherry Tomatoes and Real Fruit Minis®	Tic Tac® and Pretzel	Swedish Berries® and Gushers®	Orange and Fruit-by-the-Foot®	Apple Juice and Lays Potato Chips®
2	Animal Puzzle and Play-Doh®	Rubber snake and Coloring Book	Balloons and Miracle Bubbles®	Toy Cars and Wooden Blocks	Toy Stacker and Spin Tops
3	Crispers® and Cookies	7-UP® and Cucumbers	Popcorn Twists® and Vegetable Thins®	Teddy Grahams® and Butter Pretzels	Pickles and Carrots

one of the pictures. If the participant touched or pointed to the picture that corresponded to the object within 8 seconds (scored as correct), he immediately received the object (food for consumption or 15 seconds access for activity). If the participant touched or pointed to the picture that did not correspond to the object within 8 seconds (scored as incorrect) or did not respond (scored as no response) after 8 seconds, the trial was terminated and all stimuli were removed from the table. The next trial was then presented. The positions of the comparison pictures were counterbalanced such that the same picture did not appear for more than two consecutive trials in the same position or as the correct stimulus. The number of trials per session was not fixed during a baseline probe; rather, trials were presented until the participant made either 8 cumulative errors (fail criterion) or 8 consecutive correct trials (pass/mastery criterion). The mean number of trials per session during baseline was 17, ranging from 10 to 30 across participants.

Training procedures. During this phase, each participant received training on matching objects to their corresponding pictures across the three pairs of training tasks (see Table 1). Each training session consisted of 20 trials for Participants 1 and 2 and 30 trials for Participant 3. The training procedure consisted of a stimulus prompt-fading technique (Martin & Pear, 2007). A prompt-fading involved initially adding a stimulus (prompt) that already evoked the target response and then gradually fading out the stimulus until the response was occurring to the desired stimulus, without the prompt. The fading program in the study began with object-to-object identity matching, which all participants could perform. Next, a corresponding photograph was added beneath each comparison object on the table. At successive fading steps, the comparison objects were reduced until they were eliminated and only the photographs remained. Table 2 illustrates the fading program used for the training task, blocks and cars, for Participant 2. Each new fading step was introduced after every three consecutive correct responses at the current step, and we returned to the preceding fading step after two cumulative errors. Once the final step was reached, however, we returned to the preceding step after 8 cumulative errors. Errors accumulated at any fading step from the previous session were carried over to the next session. The mastery criterion for the training task was 8 consecutive correct responses at the final step within a session.

Differential reinforcement was used during the fading program. On each trial, if the participant pointed to the correct comparison, the object sample was immediately given to the participant for consumption if it was a food item and for 15 seconds if it was an activity, praise was provided, and the response was recorded as correct. If the participant pointed to the

Table 2. Fading program for Participant 2's "Blocks and Cars" training task

Fading Steps		*Comparisons**
Step 1.	Identity matching	4 small blocks and 4 small cars.
Step 2.	Add photographs beneath comparisons	4 blocks placed on a photograph of the 4 blocks and 4 cars placed on a photograph of the 4 cars.
Step 3.	Reduce the number of comparison objects on the photograph	3 blocks and 3 cars; photographs remained the same.
Step 4.	Reduce the number of comparison objects on the photographs	2 blocks and 2 cars; photographs remained the same.
Step 5.	Reduce the amount of the tangibles that are on the picture	1 block and 1 car; photographs remained the same.
Step 6.	(Final step) Eliminate comparison objects	Photographs only.

** Sample always consisted of objects (4 small blocks or 4 small cars) and was not faded throughout the training program.*

incorrect comparison or did not respond after 8 seconds, all stimuli were removed from the table, the participant's response was recorded as incorrect (or no response if appropriate) and then the experimenter presented the next trial. A two-week retention test was conducted for each trained task. The retention test procedure was similar to the baseline probe procedure.

Reliability Check

Interobserver reliability checks were conducted for each participant and during each phase of the study. During a reliability check, the observer and the trainer independently recorded the participant's response on each trial during a session. A trial was considered an agreement if both the observer and the experimenter recorded the same response; otherwise, the trial was scored as a disagreement. Percent agreement was calculated for each observed session. The percentage of sessions observed during each phase of the study ranged from 33% to 100%. The mean percent agreement per session across participants and phases was 99.9% (range 97.2% to 100%).

Procedural integrity (PI) checks were conducted for each participant and during each phase of the study to evaluate whether the experimenter carried out the procedures as planned. During a procedural integrity check, the observer recorded whether the experimenter carried out each trial correctly using a checklist, which included presenting the correct choices in the correct positions, providing the correct instruction, and providing the correct consequence based on the participant's response. The percentage of sessions observed during each phase ranged from 33% to 100% across participants. PI for a session was calculated by dividing the number of trials that were completed correct by the total number of trials, and multiplying by 100%. PI across participants and phases averaged 99.7% (range 96.7% to 100%).

Results

Figure 1 shows the percentages of correct trials during baseline and training sessions across the three object-picture matching tasks for Participant 1. The percentages of correct trials during baseline probe sessions were near chance level for all three tasks (range 40% to 60%) and the pass criterion of 8 consecutive correct was not met in any of the baseline sessions. After training was introduced successively across the three tasks, Participant 1 met the mastery criterion after 133 training trials for Task 1 and after 579 trials for Task 2. He did not meet the mastery criterion for Task 3 after 511 training trials, at which point training was terminated for that task. During the two-week retention tests, he met the pass criterion for Task 1, but not Tasks 2 and 3.

Figure 2 shows the percentages of correct trials during baseline and training sessions across the three object-picture matching tasks for Participant 2. The percentages of correct trials during baseline probe sessions were near chance level for all three tasks (range 43% to 60%) and he did not meet the pass criterion during any of the baseline sessions. After training was introduced for each task, Participant 2 met the mastery criteria after 55 trials for Task 1, after 64 trials for Task 2, and after 56 trials for Task 3. During the two-week retention tests, he met the pass criterion for Tasks 1 and 2, but not for Task 3.

Figure 3 shows the percentages of correct trials during baseline and training sessions across the three object-picture matching tasks for Participant 3. The percentages of correct trials during baseline probe sessions ranged from 33% to 71% and he did not meet the pass criterion during any of the baseline probe sessions. After training was introduced for Task 1, he met the mastery criterion after 48 trials and performed at 100% during the two-week retention test. He met the pass criterion for Task 2 during the second baseline probe; therefore, no training was provided. For task 3, he met the mastery criterion after 123 training trials, but did not meet the criterion during the two-week retention test.

Figure 4 shows the interspersed object and picture preference assessments results conducted during baseline (before baseline probe sessions began for the training tasks), immediately after training had been completed for each task, and a two-week follow-up (Participant 1 also had a two-month follow-up). The graphs show the mean percentages of the trials that the high-preference (HP) objects (dark bar) and the HP pictures (light bar) were selected during each assessment. During the first assessment,

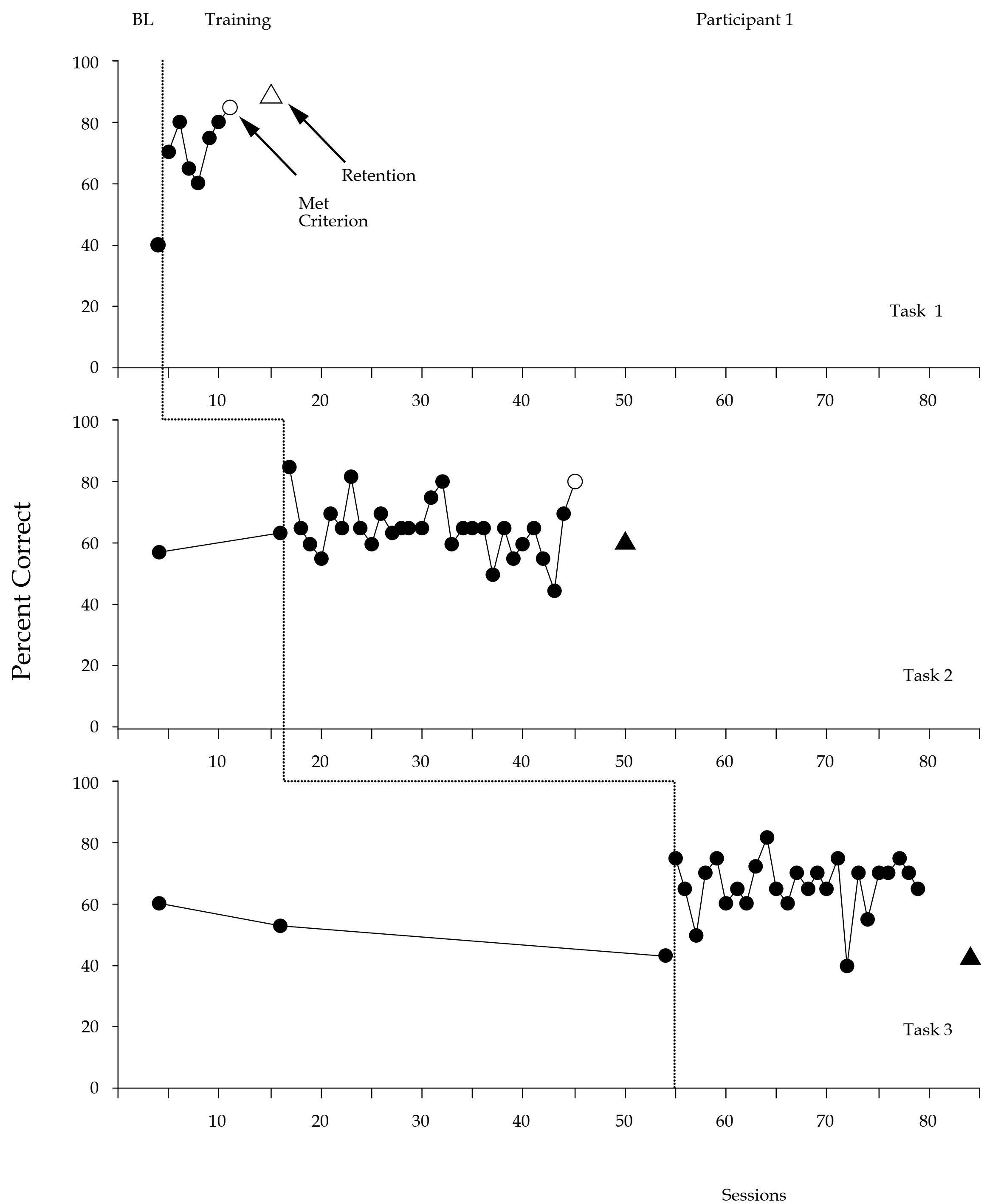

Figure 1. *Percent of correct trials per session during baseline (BL), training (●), and retention across tasks (▲) for Participant 1. Unfilled symbols (○,△) indicate that the mastery criterion of 8 consecutive correct responses was met. Participant 1 met the mastery criterion after 133 and 579 training trials for Tasks 1 and 2, respectively, but did not meet the criterion for Task 3 after 511 training trials. During the retention tests, he met the criterion for Task 1, but not Tasks 2 and 3.*

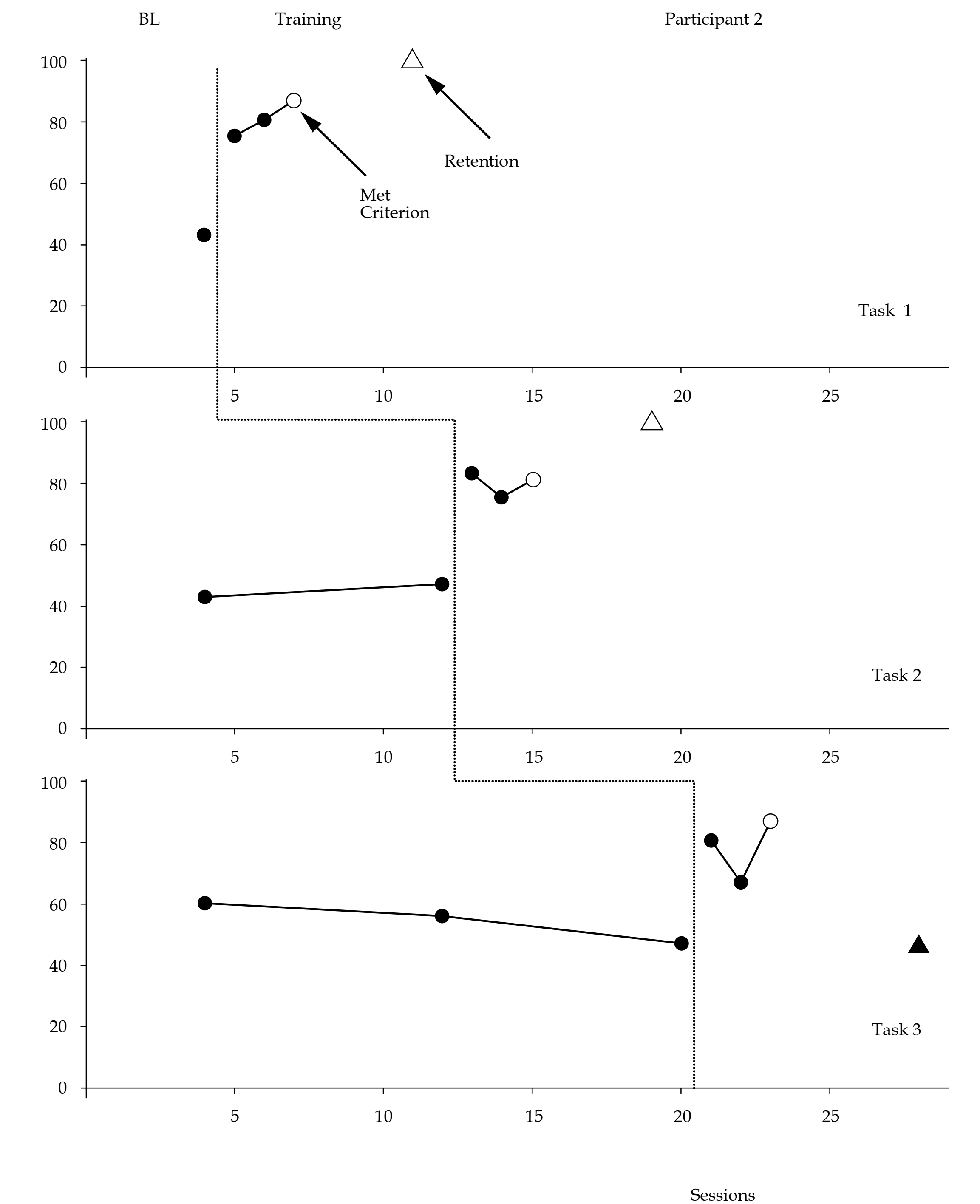

Figure 2. *Percent of correct trials per session during baseline (BL), training (●), and retention across tasks (▲) for Participant 2. Unfilled symbols (○,△) indicate that the mastery criterion of 8 consecutive correct responses was met. Participant 2 met the mastery criteria after 55, 64, and 56 training trials for Task 1, 2, and 3, respectively. During the retention tests, he met the criterion for Tasks 1 and 2, but not for Task 3.*

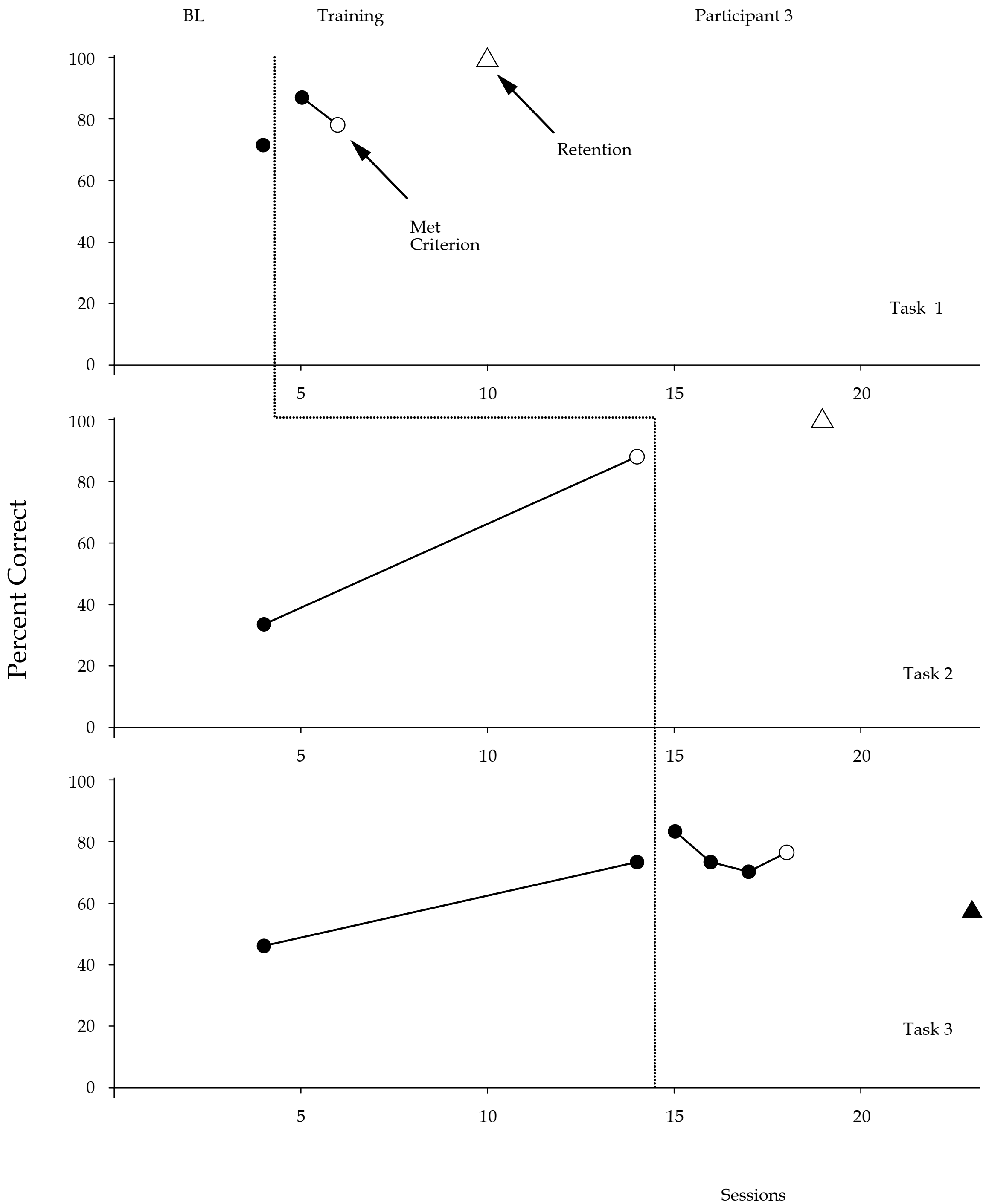

Figure 3. *Percent of correct trials per session during baseline (BL), training (●), and retention across tasks (▲) for Participant 3. Unfilled symbols (○,△) indicate that the criterion of 8 consecutive correct responses was met. Participant 3 met the mastery criterion after 48 and 123 training trials for Tasks 1 and 3, respectively. No training was provided for Task 2 because he met the criterion during the second baseline session. During the retention tests, he met the criterion for Tasks 1 and 2, but not Task 3.*

Participant 1 showed a strong preference for the HP objects (mean 94%), and his preference for the HP pictures averaged 44%. During the second assessment, conducted after Task 1 was trained, preferences for HP objects and pictures were similar to the first assessment (means of 100% and 50%, respectively). During the third assessment, conducted after training Task 2, mean preference for the HP objects decreased to 75%, whereas the mean preference for HP pictures increased by 31% to a mean of 81%. We repeated the assessment to verify the results and it yielded a slight increase for objects (mean 81%) and a decrease for pictures (mean 63%). During the fifth assessment, conducted after training Task 3 which did not meet mastery criterion after 511 training trials, preferences for HP objects (mean 81%) and HP pictures (mean 94%) were both high. During the sixth preference assessment, conducted two weeks after training was terminated for Task 3, preferences for both HP objects and pictures decreased to means of 38% and 44%, respectively, suggesting a possible preference shift for the participant who now favored the previously identified LP stimuli. During the last preference assessment, conducted two months after training Task 3, Participant 1 chose the HP objects infrequently (mean 6%) indicating a strong preference shift for the previously identified LP objects. This shift was replicated in the picture mode, with a mean of 13% for the HP pictures.

For Participant 2, the HP object preference averaged 88% and the HP picture preference averaged 56% during baseline. During the second and third preference assessments administered following mastery of Tasks 1 and 2, respectively, the results were similar to the first assessment. During the fourth preference assessment, conducted immediately after mastering Task 3, preference for HP objects and HP pictures were comparable (69% and 63%, respectively). However, this was a result of a preference decrease for the HP objects rather than an increase in preference with pictures. The last preference assessment, conducted two weeks later showed that preference for HP objects returned to baseline level of 88% and preference for HP pictures was comparable at 81%.

For Participant 3, preference for HP objects averaged 94% and preference for HP pictures averaged 50% during baseline. After mastering Task 1, object preference decreased to 56%, whereas picture preference increased to 69%. We repeated the assessment to verify the results and preferences for both objects and pictures returned to approximately baseline levels of 88% and 44%, respectively. During the fourth and fifth preference assessments, conducted after mastering Task 3 and during the two-week retention test, respectively, preferences for objects and pictures were similar to baseline on both occasions.

Discussion

We investigated whether learning object-picture matching would improve concordance between object and picture preference assessments. We hypothesized that for individuals who showed a preference with objects but not with pictures (of the same objects) during preference assessments, learning object-picture matching would enable them to indicate their preferences with pictures. The results of Participants 1 and 2 were consistent with this hypothesis.

Concordance between preferences for HP objects and pictures for Participant 1 improved after two matching tasks were mastered. Two weeks following training on Task 3, this participant's preference shifted towards the previously identified LP items in both object and picture assessments, providing additional evidence that his ability to indicate preferences using pictures improved.

The contribution of matching training to this improvement was not fully clear. Preference assessment concordance did not improve following Task 1 mastery, and the large number of trials (579) required to meet the mastery criterion on Task 2 raises a possibility that it was met by chance. In addition, although there was concordance between preferences for HP objects and pictures following training Task 3, he failed to meet the mastery criterion for Task 3.

Participant 2 showed concordance between preferences for HP objects and pictures after mastering the third task. Initially, the concordance observed was due mainly to a decline in preference for HP objects, rather than a preference increase for pictures. The last assessment, however, showed object and

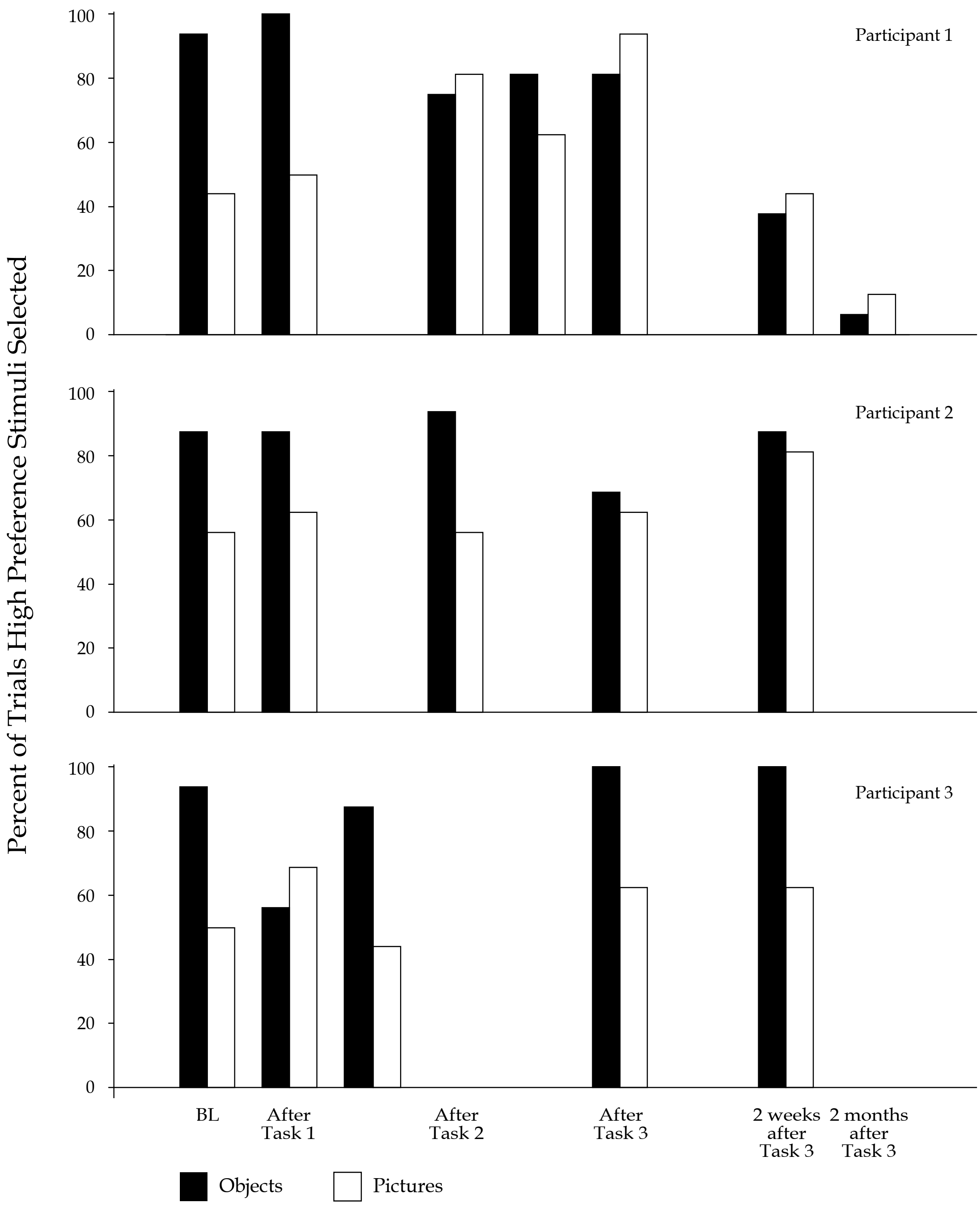

Figure 4. Percent of trials the high preference objects (dark bar) and pictures (light bar) were selected during the interspersed object and picture preference assessments at baseline (BL), after training each task, and at follow-up. Participants 1 and 2 showed improved concordance between preference assessments using objects and pictures of the same objects after mastering two and three training tasks, respectively. Participant 3 did not show concordance between object and picture preference assessments after mastering two tasks.

picture preference concordance even after preference for objects returned to baseline level. Perhaps the instability observed may be due the fact that preferences for the HP items were not very strong at the beginning of the study (means ranged from 75% to 79% across participants). Items with a preference in this range may be more susceptible to satiation effects with repeated exposures throughout the study. Therefore, identifying and using items with a stronger preference (e.g., 90% or higher) may alleviate this problem in future research.

Since the object-picture training tasks did not resemble the items used during preference assessments, improved concordance between object and picture preferences for Participants 1 and 2 may have been a result of generalization of object-picture matching skills. However, we did not assess whether these participants exhibited generalized matching. This assessment would be a valuable addition in future research.

A limitation of the study is that we did not control for the effects of repeated preference assessments. It is possible that the repeated interspersed object and picture preference assessments may have contributed to the improved concordance. Although this possibility was mitigated somewhat by Participant 3's failure to show improvement even after repeated assessments and after object-picture matching training, future research should investigate this possibility.

Another limitation of this study is that we did not assess whether the HP items were reinforcers through independent testing. Although ample research has shown that HP items tend to function as reinforcers, including independent reinforcer tests would have added to the value of the findings to ensure that the improved picture preference assessments are identifying stimuli that not only correspond to objects assessments but that are also reinforcers. Lastly, we used response specific reinforcers during training to promote generalization to preference assessments (e.g., the participant received a toy car for matching cars correctly and wooden blocks for matching blocks correctly). Therefore, the matching response may have also functioned as a request. Further research is needed to clarify this function.

Future research is also needed to examine strategies for helping individuals like Participant 3 in this study. Participant 3 was not trained on Task 2 because he met the pass criterion during the second baseline probe session (and during the two-week retention test). Would additional training have an impact for this participant? We explored this possibility. After completing all of the preference assessments for this participant, we assessed him and found that he was unable to match the objects and pictures when the pictures were presented as samples and the objects, as comparisons (he was trained to match objects-to-pictures). Therefore, we repeated the experiment with Participant 3 and taught him to match pictures-to-objects. He met the mastery criterion on each task rapidly within two to three training sessions. However, the additional training did not improve concordance between preferences for objects and pictures during the interspersed object and picture assessments conducted after each task was trained. Perhaps training additional exemplars using new task stimuli, rather than the reversed matching relation, is necessary to promote generalized matching and concordance between object and picture preferences. Future research needs to examine both possibilities.

In summary, previous research has reported that being able to perform matching-to-sample discriminations is correlated with the ability to respond to picture preference assessments. We extended this research by examining whether the relation is functional. Two of the three participants showed improved concordance between object and picture preference assessments after receiving training on two and three object-picture conditional discriminations, respectively. These results suggest that the relation is functional. Further research is needed to establish generality of our findings. Future research on teaching individuals to reliably respond to picture preference assessments is highly worthwhile given the practical benefits of pictures over objects preference assessments.

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References

Baer, D. M. (1998). Commentary: Problems in imposing self-determination. *Journal of the Association for Persons with Severe Handicaps, 23*, 50–52.

Bruininks, R. H., Woodcock, R. W., Weatherman, R. F., & Hill, B. K. (1996). *Scales of Independent Behaviour-Revised (SIBR).* Rolling Meadows, IL: Riverside publishing.

Clevenger, T. M., & Graff, R. B. (2005). Assessing object-to-picture and picture-to-object matching as prerequisite skills for pictorial preference assessments. *Journal of Applied Behaviour Analysis, 38*, 543–547.

Cohen, I. L., & Sudhalter, V. (2005). *The PDD Behaviour Inventory*. Lutz, FL: Psychological Assessment Resources, Inc.

Conyers, C., Doole, A., Vause, T., Harapiak, S., Yu, D. C. T., & Martin, G. L. (2002). Predicting the relative efficacy of three presentation methods for assessing preferences of persons with developmental disabilities. *Journal of Applied Behaviour Analysis, 35*, 49–58.

de Vries, C., Yu, C. T., Sakko, G., Wirth, K. M., Walters, K. L., Marion, C., & Martin, G. L. (2005). Predicting the relative efficacy of verbal, pictorial, and tangible stimuli for assessing preferences of leisure activities. *American Journal on Mental Retardation, 110,* 145–154.

Fisher, W. W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behaviour Analysis, 25*, 491–498.

Hersen, M., & Barlow, D.H. (1976). *Single case experimental designs: Strategies for studying behaviour change*. Elmsford, NY: Pergamon.

Horner, R. D. & Baer, D. M. (1978). Multiple-probe technique: A variation to the multiple baseline. *Journal of Applied Behaviour Analysis, 11,* 189–196.

Kerr, N., Meyerson, L., & Flora, J. (1977). The measurement of motor, visual and auditory discrimination skills. *Rehabilitation Psychology, 24,* 156–170.

Lee, S. H., Nguyen, D., Yu, C. T., Thorsteinsson, J.R., & Martin, T. (2008). Discrimination skills predict effective preference assessment methods for adults with developmental disabilities. *Education and Training in Developmental Disabilities, 43,* 388–396.

Martin, G. L., & Pear, J. J. (2007). *Behaviour modification: What it is and how to do it* (8th ed.). Upper Saddle River, NJ: Prentice Hall.

Martin, G. L., & Yu, C. T. (2000). Overview of research on the Assessment of Basic Learning Abilities Test [Special Issue]. *Journal on Developmental Disabilities, 7(2),* 10–36.

Reyer, H. S., & Sturmey, P. (2005). The Assessment of Basic Learning Abilities (ABLA) test predicts the relative efficacy of task preferences for persons with developmental disabilities. *Journal of Intellectual Disability Research, 50*, 404–409.