The Use of Concurrent Operants Preference Assessment to Evaluate Choice of Interventions for Children Diagnosed with Autism

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The present study used a concurrent operants preference assessment to evaluate preference for two instructional approaches commonly used with children diagnosed with autism, Applied Behavior Analysis (ABA) and the Treatment and Education of Autistic and Communication Handicapped Children (TEACCH). Results showed that the three children with autism participating in the study did not show a clear preference for one training procedure over the other, although the percentage of ABA choices was slightly higher than the percentage of TEACCH choices (53.6% vs. 46.4%). Data on time on task, problem behaviors, and positive affect did not show any clear differences between the two procedures. Possible explanations for these findings are discussed.

Two common instructional approaches for teaching basic academic skills to children diagnosed with autism are Applied Behavior Analysis (ABA) and the Treatment and Education of Autistic and Communication Handicapped Children (TEACCH). According to Choutka, Doloughty, and Zirkel (2004), both approaches advocate parent involvement, structured transition periods, and supportive teaching arrangements. Despite these apparent similarities, a number of differences exist between the core values and philosophies of these instructional approaches.

The goal of ABA programs is to provide the child diagnosed with autism the skills needed to appear indistinguishable from peers (Jennett, Harris, & Mesibov, 2003; Kazdin, 2001), whereas the goal of TEACCH is to respect the culture of autism, therefore, not focusing on diminishing the differences between children diagnosed with autism and typically developing children (Mesibov & Shea, 2004). Furthermore, the ABA and TEACCH programs differ in terms of which skills are determined to be of greatest importance to teach. While ABA programs focus on teaching children new skills in areas that the child has documented deficits, the TEACCH program emphasizes the child's strengths and interests when determining which skills should be taught. The goal of this process is to continue strengthening the areas in which the child has already demonstrated interest and ability (Jennett et al., 2003). In terms of reinforcement, ABA therapists focus on using external sources of reinforcement (social praise, tangible items, etc). According to Jennett et al. (2003) TEACCH therapists shy away from the use of external reinforcement, and instead use activities for which the child has demonstrated a preference.

The differences in the philosophy and values of the two interventions often cause a split in the opinions of professionals who work with children diagnosed with autism, with professionals often being loyal to one approach over the other. Additionally, the decision regarding which treatment to use often is made by professionals and/or parents, not the child in question due to the fact that the child often does not have the ability to specify which treatment program he or she prefers. Thus, loyalty to one intervention over the other may solely influence the decision regarding which treatment program will be selected for a child. Although the chosen treatment should be supported by empirical evidence, the preference of the individual receiving the treatment should also be taken into account before a treatment plan is devised given the importance of providing choice or considering preference when developing programs for individuals with autism and other disabilities (e.g., Romaniuk & Miltenberger, 2001).

When attempting to examine a nonverbal child's preference for training programs, difficulties arise because one cannot simply ask such a child which training program he or she prefers. One strategy to assess preference in such cases is the use of a concurrent-operants arrangement. In a concurrent-operants assessment two or more responses are available to an individual, and each response is associated with an independent schedule of reinforcement or different reinforcing outcome (Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997). Thus choice responding is a highly sensitive measure of the individual's preference for concurrently available reinforcers (Fisher & Mazura, 1997).

Research has indicated that such a paradigm is effective for assessing an individual's preference for different schedules or types of reinforcement (Catania & Sagvolden, 1980; Hanley, et al., 1997; Herrnstein, 1964) and for different approaches to treatment (Hanley et al., 1997). In a study conducted by Hanley et al. (1997), a concurrent-operants preference assessment was used to evaluate the relative preference for two treatment procedures: functional communication training (FCT), and noncontingent reinforcement (NCR). Training sessions were conducted with each participant for the purpose of exposing the participant to the different contingencies that were associated with each operant (pressing a switch). The participant's switch pressing resulted in 2 min of the contingency associated with the chosen response. After the 2 min treatment session was completed, the participant was once again prompted to choose a switch. After the completion of the training session, the treatment preference session was conducted for 20 min. Results indicated that both participants had a higher relative response rate for FCT than NCR, thus suggesting that the participants preferred the ability to control the rate of reinforcement during treatment.

According to Mazur (1994), factors relating to reinforcement, such as the rate and type of reinforcement, may affect an individual's preferences for one treatment over another. The rate of reinforcement that an individual receives in discrete trial training (ABA) is much greater than the rate of reinforcement that is received via TEACCH. During discrete trial training, the learner receives reinforcers for every correct response, or at very least, a successive approximation to a correct response. Conversely, during TEACCH the learner receives a reinforcer after he or she completes a task involving a longer chain of behaviors (Jennett et al., 2003).

With the prevalence of autism increasing in recent years, professionals and parents need to make decisions regarding treatment options for children diagnosed with autism. The decisions being made regarding a child's educational plans are often made by parents and professionals, without regard for the perspective of the child. At the time of this review, no research exists that specifically examines the social acceptability of, or preference for intervention approaches such as

ABA and TEACCH, from the perspective of the consumer (i.e., the child).

Most research examining the social acceptability of treatments for individuals with developmental disabilities involves the use of indirect measures completed by individuals, such as caregivers, rather than consumer themselves (Miltenberger, 1990). Allowing individuals to choose treatment programs is a clear measure of the program's social validity (Schwartz & Baer, 1991). The use of the concurrent operants preference assessment may be beneficial in assisting children with autism to maintain greater control over which instructional approach they receive in home and school therapy programs.

The purpose of the present study was to assess preference for two training programs commonly used with children diagnosed with autism, ABA and TEACCH. A concurrent operants assessment was used to evaluate the participant's preference for training program (Catania & Sagvoldgen, 1980; Hanley et al., 1997). We hypothesized that participants would have a higher relative response rate for ABA due to the fact that they would have more control over the rate of reinforcement, that the participants engaged in the ABA training program would engage in a higher percentage of on-task behavior because there is a direct association between on-task responding and reinforcement, and that participants should demonstrate more behaviors related to positive affect, such as smiling and laughing, when in the ABA room.

Method

Participants and Setting

Participants were 3 children who met the DSM-IV-R (American Psychiatric Association, 2000) diagnostic criteria for autism spectrum disorder. The participants selected for inclusion in the study were already receiving both TEACCH and ABA instructional programs. The participants were recruited by sending letters to a local group for families with children diagnosed with autism inviting them to participate in the research study, and through an ad in a local newspaper. Those who signed consent forms and completed the entire protocol were included in the study. JS was a 16 year old girl, BF was a 10 year old girl, and CS was a 6 year old boy. Preference assessment

sessions were conducted in two identical laboratory rooms in a university psychology department. In each room, the preference assessment occurred in an area that was free from distracting stimuli.

Materials

The study employed the use of two colored cards and colored poster boards, one red and one blue. Each room was identical, with the exception of the red colored poster board (signifying the ABA condition) or the blue colored poster board (signifying the TEACCH condition). Both rooms were equipped with videocameras for the purpose of recording each treatment session to ensure the quality and consistency of the treatments that were given, and for recording the participants' behavior during the sessions.

Target Behaviors and Data Collection

Four dimensions of preference for the training programs were recorded; choice, time on task, problem behavior, and affect. Operational definitions for each of these dimensions are described below.

Choice. The percentage of choice responding was measured across all preference assessment sessions. The percentage of choice responding was calculated by dividing the number of choices per training program by the entire number of choices made and multiplying by 100.

Time on task. Time on task was defined as the percentage of time that the participant was actively engaged in the required work task. Time on task was recorded on a second by second basis using real time recording.

Problem behaviors. Problem behaviors, defined for each individual and recorded during the training activity using real time recording, were reported as a percentage of session time.

Affect. Positive affect was defined as the percentage of session time the participant engaged in smiling, laughing, or positive vocalizations during the training program.

Interobserver Agreement

To assess interobserver agreement, 100% of the videotapes were reviewed and scored by independent observers. Agreement for choice

responding was calculated by dividing agreements by agreements plus disagreements. Agreement on time on task, problem behaviors, and affect was calculated by dividing the number of seconds of agreement by the total number of seconds of observation. Interobserver agreement was 100% for choice behavior, 81% for on task behavior, 90% for problem behavior, and 84% for affect.

Treatment Integrity

All preference assessment sessions were videotaped by a researcher for the purpose of assessing treatment integrity. Behaviors that were scored were proper room arrangement (1 point), task presentation (1 point), prompts that adhered with the individual treatment protocols (1 point), rate of reinforcement (1 point), and intensity of reinforcement (1 point). Treatment integrity was calculated by adding the total number of points determined for each preference assessment session. The mean treatment integrity score for the ABA training sessions was 4.95 (99%). The mean treatment integrity score for the TEACCH training sessions was 4.45 (89%). The treatment integrity score for TEACCH was slightly lower due to the incorrect delivery of prompts during a few sessions. The therapist provided verbal prompts first, instead of following the correct chain of prompts (point, gesture, verbal).

Procedure

Participants participated in initial training to develop the behavior of choosing the red or blue square to enter into the respective training room. After initial training was complete, the participants participated in the concurrent operants preference assessment.

Initial training. At the beginning of the study, the participant was taught to touch a colored card to enter a training room. In this session the experimenter physically guided the participant to choose each card. Touching a colored card resulted in the child entering the corresponding room, and participating in the chosen intervention. After the completion of the session, the participant exited the room and once again was positioned in front of the colored cards. This procedure was continued until the participant had the opportunity to select each card three times, thus having completed 3 sessions of each respective training

program. The position of the red and blue rooms remained the same across all trials.

Preference assessment. Preference evaluation sessions were similar to the training sessions. The researcher stood behind the participant and asked the child to choose a colored card. Once the participant touched a colored card, the researcher and the participant entered the chosen training room, and engaged in the chosen training program. After completion of the chosen training program, the researcher and participant left the chosen room, and once again positioned themselves in front of the two colored cards. This process was repeated for a set number of choice opportunities (i.e., 5 choices), determined on a case by case basis for each participant. For example, it was reported by CC's parents that he would not tolerate long periods of work. His preference assessment sessions were shorter in duration than JS and BF to accommodate parental requests, thus resulting in a smaller number of choice opportunties per session. The preference evaluation sessions were conducted until the data were stable in each condition (no upward or downward trends). The location of therapy rooms remained consistent across all trials, with red always denoting ABA, and blue always denoting TEACCH. The preference assessment sessions occurred over a period of two to three days. Within each room there were three work tasks. The ABA and TEACCH room contained identical work tasks.

In the ABA training room the researcher conducted a discrete trials training session with the participant. The experimenter and the participant entered the room and sat at a small work table. The experimenter was seated across the table from the participant. The experimenter delivered the discriminative stimulus for the desired behavior, and either provided praise for correct responses, or corrected incorrect responses. Correcting incorrect responses involved repeating the discriminative stimulus and immediately prompting the child to

engage in the correct behavior. Because the skills being worked on were already in the participant's repetroire, prompting the correct behavior was unnecessary during most sessions.

In the TEACCH training room, the researcher asked the participant to engage in independent work time at a small work station located in the room. The work station was set up to include two to three baskets of mastered items to the left of the participant, and a spot on the right side of the table for the participant to place the basket when he or she has completed the task. There was also a visual schedule on the table that allowed the participant to view the tasks that needed to be completed. The experimenter was positioned behind the participant during the independent work time and delivered praise only for task completion. Unlike the ABA program, which provided praise for both successive approximations to completing the task (e.g., completing two pieces of a six piece puzzle) and completion of the task, the TEACCH program only provided praise for final task completion, not successive approximations that lead to the final task completion.

Results

The results for the preference assessment are shown in Figure 1. During the forced choice condition (the first data point), the participants were physically prompted to choose each room 3 times. The remaining five sessions show the preference data. The three children participating in the study demonstrated no clear preference or perhaps a slight preference at best for the ABA training program. CC chose ABA over TEACCH in 2 of the 5 preference assessment sessions and chose the two procedures equally in the other three. CC chose ABA in 56.8% of trials and TEACCH in 43.2% of trials. The other two participants chose ABA most in three sessions and TEACCH most in two sessions. They each chose ABA in 52% of trials and TEACCH in 48% of trials.
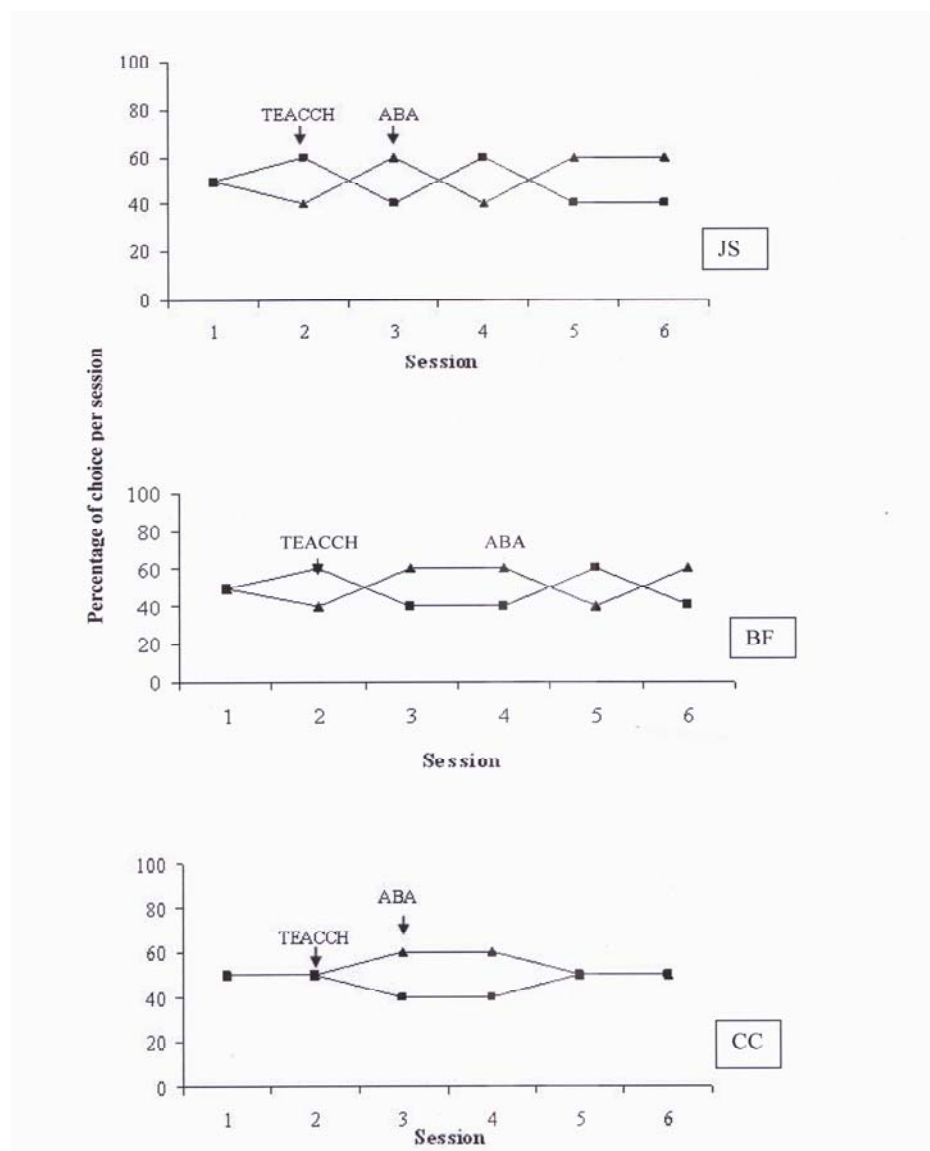
The results in Figure 3 depict the percentage of session time that the participants spent engaged in problem behaviors. Problem behavior was low across both conditions for all participants. JS's problem behaviors were defined as refusal to sit in her chair, yelling, and a very loud shrieking laugh. The mean percentage of session time JS engaged in problem behavior was 6% for ABA and 9% for TEACCH. BF's problem behaviors were defined as refusal to complete her work, throwing objects, and whining. The mean percentage of session time BF engaged in problem behavior was 5% for ABA and 2% for TEACCH. CC's problem behaviors were defined as putting his head on the desk and getting up from the desk. The mean

Figure 1. Percentage of choices made per session. The diamonds represent the ABA training program; the squares represent the TEACCH training program.

The results in Figure 2 depict the percentage of session time that the participants spent engaged in on task behavior. For JS the mean percentage of on task behavior was 97% for the ABA sessions and 93% for the TEACCH sessions. For BF the mean percentage of on task behavior was 99% for the ABA sessions and 90% for the TEACCH sessions. For CC the mean percentage of on task behavior was 65% for the ABA sessions and 85% for the TEACCH sessions. There was a large drop off in time on task in later ABA sessions for CC.

percentage of session time BF engaged in problem behavior was 3% for ABA and 5% for TEACCH. The results in Figure 4 depict the percentage of sessions time that the participants displayed positive affect. Positive affect was defined as engaging in smiling, laughing, or positive vocalizations during the training program. The mean percentage of session time JS displayed positive affect was 8% for ABA and 10% for TEACCH. The mean percentage of session time BF displayed positive affect was 1% for ABA and less than 1% for TEACCH. The mean percentage of
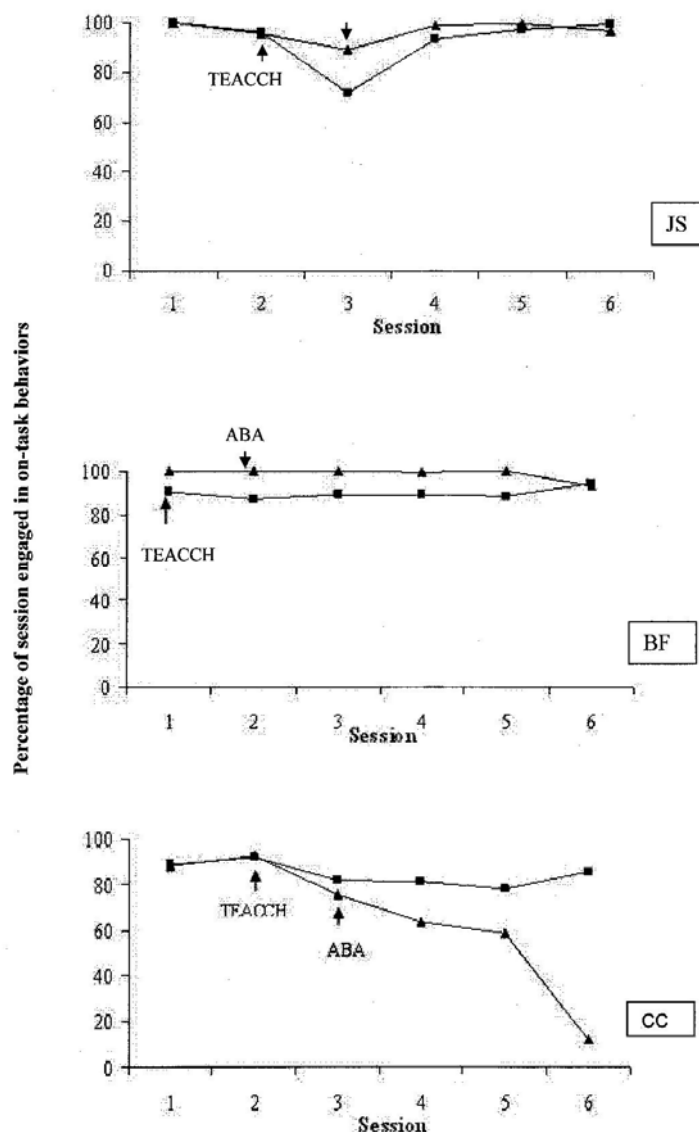
Figure 2. Percentage of session time engaged in on task behavior. The diamond represents the ABA training program; the square represents the Project TEACCH training program.

1964). Data on time on task, problem behaviors, and positive affect did not show any clear differences between the two procedures. These results also failed to support the hypothesis that participants would show an increase in positive affect, time on task, and decreased problems behaviors due to the increased rate of reinforcement in the ABA training program.

Three possible conclusions can be drawn from the results of this study. One is that a concurrent operants preference assessment may not be an effective tool for assessing training program preference for children diagnosed with autism. A second is that the three students in this study did not have a clear preference for one of the two procedures under investigation, whereas other children may have more distinct preferences. A third conclusion is that the assessment was not conducted long enough for clear preferences to emerge. This final possibility seems least probable given the three participants' substantial prior exposure to the two procedures and the fact that preferences have been shown in as few as five concurrent operants choice sessions in previous research (Hanley et al., 1997).

session time CC displayed positive affect was 5% for ABA and 4% for TEACCH.

Discussion

Overall the results of this study showed that the participants did not show a clear preference for one training procedure over the other, although the percentage of ABA choices was slightly higher than the percentage of TEACCH choices (53.6% vs. 46.4%). Although the reinforcement rate was considerably higher in the ABA room, participants did not show a preference for this method. This finding is contrary to what would be expected based on Herrnstein's Matching Law (Herrnstein,
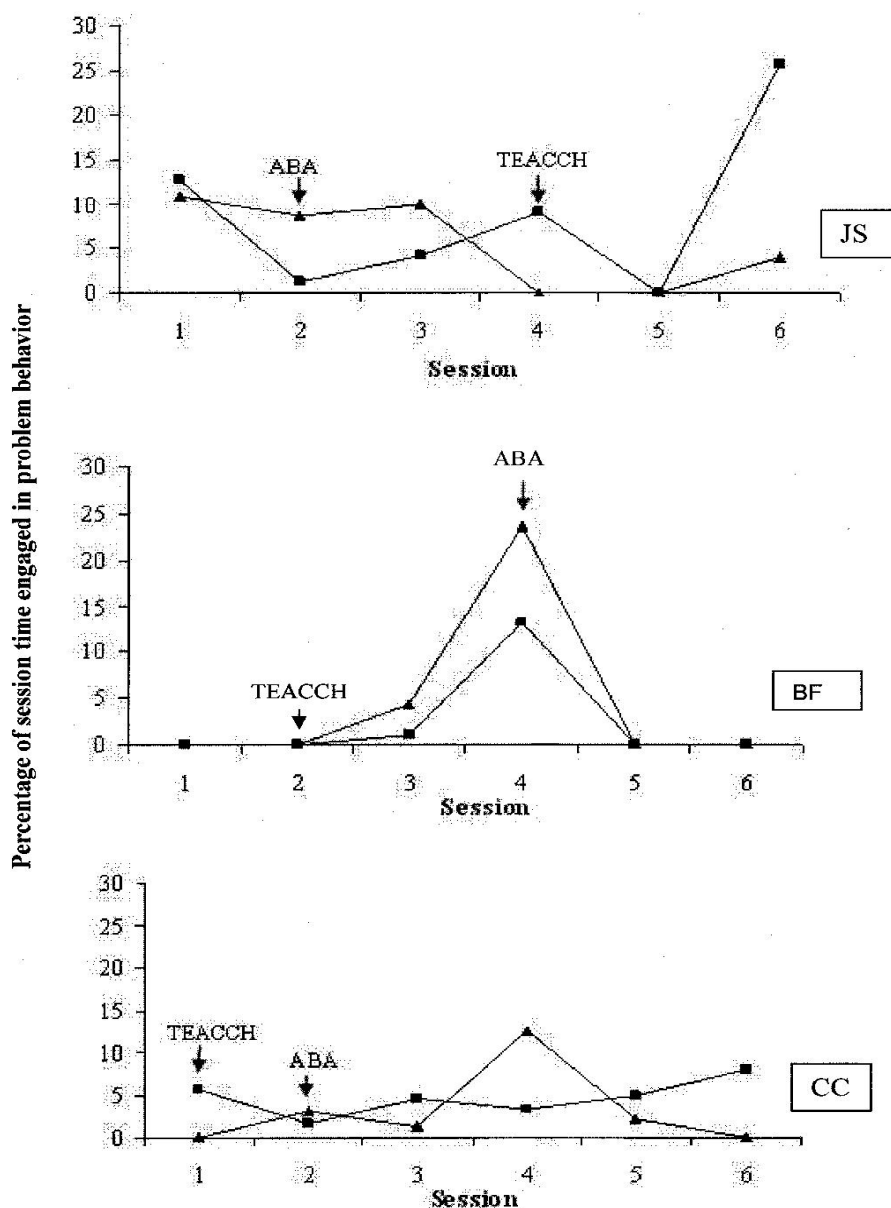
Figure 3. Percentage of session time engaged in problem behavior. The diamond represents the ABA training program; the square represents the Project TEACCH training program.

the results of this preference assessment indicates that the 3 individuals participating in the study did not have a preference for either training program. It is possible however, that the reinforcement derived from manipulating the materials in the TEACCH sessions competed with the greater level of social reinforcement received in the ABA session. If this is the case (and unfortunately it cannot be proved or disproved), then the results may be consistent with the matching law. Although this is a post hoc and speculative explanation of the data, it is one possibility that may account for the results.

According to Herrnstein's Matching Law (Herrnstein, 1964), an individual will engage in response allocation for concurrent operants in direct proportion to the reinforcement derived from each operant. According to this theory, an individual should have a higher relative response rate for those operants that provide the highest rate and quality of reinforcement. Unfortunately, the results of this study do not support this hypothesis. Although the ABA training session has a schedule of reinforcement that is much greater than that of the Project TEACCH training session,

One limitation of this study was the small sample size. Of the 4 children we were able to recruit, only 3 children started and completed the study protocol. Future research should include more participants to determine whether these findings would be replicated. Furthermore, a formal preference assessment was not conducted to identify reinforcers that could be used along with praise during training sessions. Future replications of this study may benefit from the addition of a preference assessment.
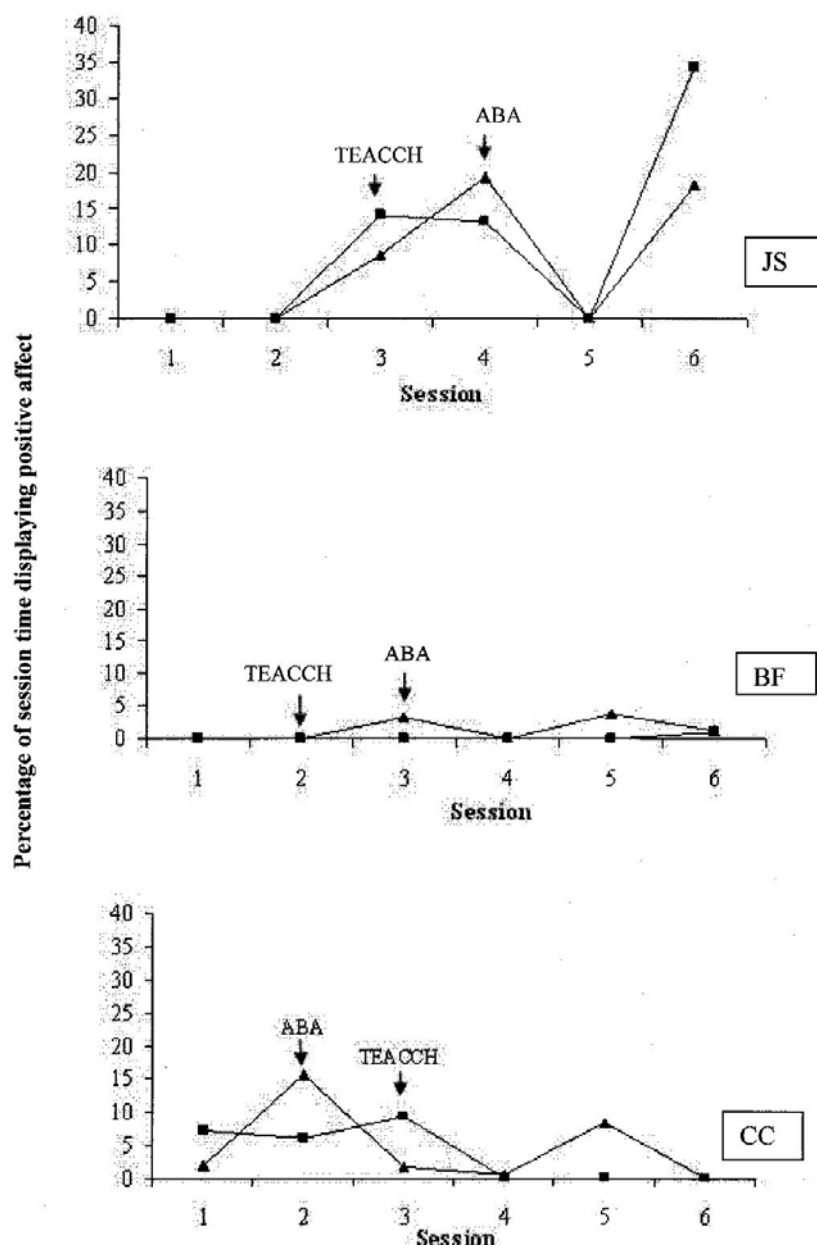
that our participants were trained in the initial forced choice condition to select each room every other time, it may be possible that the forced choice training affected the outcome of this study. Once the preference assessment condition began, the participants continued to alternate between training programs. JS was so consistent with her choice pattern that she ended a session with one training program, and come back after a session break, and chose the opposite training program. It is possible that the participants learned switching rooms as an operant and continued to engage in this behavior during the assessment. Further research should examine the effects of the initial forced choice condition on preference

Figure 4. Percentage of session time displaying positive affect. The diamond represents the ABA training program; the square represents Project TEACCH

Further investigation is warranted to evaluate the utility of the forced choice training that occurs in the initial stage of the concurrent operants preference assessment method. During the initial training, participants are prompted to choose one procedure and then the other in an alternating fashion to get exposed to each procedure equally. Future research should examine the role of the initial forced choice training on the outcome of a concurrent operants preference assessment with children diagnosed with autism. Due to the fact

assessment outcomes. One possibility to prevent this problem in future research is to limit the forced choice training session to one trial per room. Thus, no pattern of choice would be learned as a potential confound. Another possibility is to expose participants to the treatment rooms in random order rather than alternative on each trial.

Considering the growing literature on the use of concurrent operants preference assessments with children and individuals with developmental disabilities (e.g., Hanley et al., 1997) and the fact

that this form of preference assessment is most tied to actual behavior of the participant (rather than parent report or inference), more research is needed to establish the generality of the approach for children with autism. Future research should evaluate choice of intervention, choice of training materials, choice of leisure materials, and other important choices that impact the quality of life for children (and adults) with autism.

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