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MULTIPLE FUNCTIONS OF PROBLEM BEHAVIORS: ASSESSMENT AND INTERVENTION

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Three individuals with severe intellectual disabilities participated in separate analyses of problem behavior. In each case, a functional analysis was conducted under two parallel conditions. In one condition, self-injury or aggression resulted in escape from difficult tasks; in the second condition, the same problem behavior resulted in access to preferred items. Results indicated that the problem behaviors for each participant were maintained by both types of contingencies. Functional communication training was then delivered first in one condition and then in the second. After each participant was trained in a functionally equivalent mode of communication for one condition, levels of problem behavior decreased in that condition but not in the untrained condition. Only after separate communication forms were trained in both conditions was problem behavior reduced to clinically acceptable levels. These results document three examples of problem behaviors under multiple control, and emphasize the need to organize interventions that address different contingencies of reinforcement that maintain the same problem behavior.

DESCRIPTORS: functional analysis, communication training

Problem behaviors may serve multiple functions (Carr, 1977; Durand, 1982; Iwata, Vollmer, & Zarcone, 1990; Mace, Lalli, Lalli, & Shea, 1993; Paisey, Whitney, & Hislop, 1990; Schroeder & MacLean, 1987). Under one set of conditions aggressive behavior may be maintained by social attention (positive reinforcement), and under a different set of conditions the same response may be maintained by escape from nonpreferred tasks (negative reinforcement). The multiple functions associated with problem behaviors may explain why in some instances a functional assessment produces undifferentiated results (Smith, Iwata, Vollmer, & Zarcone, 1993), or why an intervention appears to produce only partial reductions in problem behavior (Durand & Carr, 1992).

Iwata, Dorsey, Slifer, Bauman, and Richman (1982) hypothesized that self-injurious behavior (SIB) may serve multiple functions for individuals whose behavior did not show clearly differentiated patterns. More recent data from over 150 cases support this hypothesis (Iwata et al., 1994), and the application of multiple baseline assessments has provided one approach for identifying multiply maintained responses (Smith et al., 1993). These results are further supported by Haring and Kennedy's (1990) demonstration that the function of a behavior may be affected by the context in which the behavior occurs. Their data demonstrated that differential reinforcement of other behavior and time-out treatments were differentially effective in reducing behavior in different contexts.

The fact that specific problem behaviors may serve multiple functions holds important implications for functional assessment. Not only may mul-

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tiple functions cloud the clear identification of one function, but as Carr and Carlson (1993) suggested, the assessment may need to occur across the range of stimulus conditions in which the problem behavior has been observed. A basic purpose of functional assessment is to identify variables that improve the effectiveness and efficiency of a clinical intervention. Identifying the fact that a problem behavior is maintained by multiple reinforcers, or that the same behavior serves different functions under different stimulus conditions, would be of direct value for building clinical programs. It would be expected that different clinical procedures would be needed to address each of the multiple functions served by the problem behavior (Carr & Carlson, 1993). The present study extends the current literature by demonstrating the assessment and intervention procedures with 3 individuals for whom problem behaviors served multiple functions. In each case a functional assessment was performed to document the multiple functions, and functional communication training was implemented to address each of the identified functions.

METHOD

Participants and Setting

Three individuals with severe intellectual disabilities participated in the study. Brandi was 9 years old and had been diagnosed with autism. Her Vineland Social Maturity Scale scores indicated an age equivalence of 1 year 2 months. Her current instructional goals focused on personal management skills, and she communicated via simple gestures. Brandi was not taking any medication during the study.

Dawn was 34 years old and had been identified as having severe intellectual disabilities (age equivalence of 1 year 5 months on the Vineland Social Maturity Scale) with controlled seizure disorder. Her current instructional goals focused on toileting, dressing, and eating. Dawn communicated via simple gestures and was taking 350 mg of Dilantin® per day during the study.

Jamie was 18 years old with diagnoses of severe intellectual disabilities, hyperactivity, and mild spastic quadriplegia. His Vineland Social Maturity Scale scores produced an age equivalence of 1 year 8 months. His instructional goals focused on personal hygiene, choice making, dressing, and toileting. Jamie communicated via simple gestures and was not taking medications during the study. Each participant had a history of severe aggression or self-injury, and indirect assessment procedures in both training and nontraining contexts (Durand, 1990; O'Neill, Horner, Albin, Storey, & Sprague, 1990) suggested that their problem behavior was under the control of multiple contingencies. Instruction and data collection were conducted in the homes of the participants during typical routines with staff members who had been with the participants for several months prior to the study.

Measurement

Data were collected during 15- to 20-min training sessions. During each session, discrete training trials were presented on tasks drawn from each participant's individualized plan. Data were collected on (a) the percentage of training trials per session in which the participant performed the task correctly, (b) the percentage of trials during which targeted problem behaviors occurred, and (c) the percentage of trials during which an alternative communication response was performed. Correct task performance was measured by a trained observer on a trial-by-trial basis using a conventional task-analytic scoring sheet (Schreibman & Koegel, 1981). Each trial was recorded as "correct," "incorrect," or "no attempt."

The occurrence of any problem behaviors during a trial was also recorded. For Brandi the targeted problem behavior was a rapid self-injury sequence in which she bit her hand, pinched anyone near her, and hit her head. This response sequence typically occurred as part of a single event. For Dawn, the target problem behavior was self-injury in the form of hitting her head with her fist or hitting her head on an object. For Jamie, the target behavior was aggression in the form of grabbing the trainer and biting or attempting to bite. Data were collected by an experienced observer who recorded the

targeted problem behavior if one or more instances occurred at any time between the request by the trainer to start the trial and the trial-ending praise given by the trainer for (a) completing the trial correctly, (b) sitting well, or (c) cooperating.

Each participant was taught alternative mands for requesting items from the trainer or for escaping difficult tasks. During sessions, the observer recorded the performance of the alternative mand during a trial. To ensure that trainer praise was not systematically altered across conditions, the observer also recorded occurrences of trainer praise at the conclusion of each trial.

Interobserver Agreement

A second observer independently recorded each variable during 25% of the sessions for each participant. Occurrence agreement was determined on a trial-by-trial basis for each variable by dividing the number of trials in which both observers recorded the event by the number of trials in a session in which at least one observer recorded the event and multiplying by 100%. Mean agreement across the 3 participants was 92% for problem behaviors (range, 50% to 100%), 94% for alternative mands (range, 67% to 100%), 99% for correct performance (range, 92% to 100%), and 100% for trainer praise.

Design and General Procedures

Independent but similar experimental designs were used with each participant. The initial four phases in each design provided an ABAB functional analysis testing the hypothesis that the targeted problem behaviors were maintained by multiple contingencies. The latter phases of each experiment provided a two-series, within-subject, alternating treatment design to examine the effect of functional communication training (FCT) (Carr, in press; Durand, 1990).

Across all phases of each experiment, two separate conditions were examined (want and escape). In the want condition, training was conducted with easy tasks, and a presumably preferred item was visually present and within reach. Easy tasks were defined as those that the participant could perform correctly without assistance on 70% of the trials, and for all 3 participants involved the imitation of simple sounds or movements (e.g., "stand up," "clap hands"). Preferred items for Brandi and Jamie were small amounts of food, and preferred items for Dawn were 2 oz of coffee plus 10 to 20 s of access to a necklace. The indirect assessment information indicated that each participant was likely to engage in targeted problem behaviors if the behaviors resulted in access to these items.

The escape condition involved the presentation of difficult tasks, which were nominated by staff as being performed correctly without trainer assistance on less than 33% of the training trials. Difficult tasks for Brandi, Dawn, and Jamie, respectively, were (a) orienting and putting on a shirt, (b) silverware sorting, and (c) identity matching of personal objects. Training sessions lasted 15 to 20 min and were conducted three to five times per week, with alternation of want sessions and escape sessions.

The procedures were designed to compare situations in which (a) tasks were either easy or difficult, (b) preferred items were either present or absent, and (c) SIB or aggression was (or was not) the most efficient response to obtain reinforcement. Table 1 provides a summary of the conditions and contingencies for each phase. Detailed descriptions of phase procedures are provided below.

Task R+/want. In this condition, each participant was presented with easy tasks, and preferred items were presented after each trial. Preferred items were present and within reach on a table. For Brandi and Jamie, access to preferred items consisted of 2 to 3 s to eat small bites of food, and for Dawn it involved 10 to 20 s to sip coffee and play with a necklace. Sessions were conducted daily, and 40, 20, or 40 trials were presented per session, respectively, to Brandi, Dawn, and Jamie. If a trial was performed correctly, praise was delivered. If a trial was incorrect (or no attempt was made after 5 s), the trainer repeated the presentation with added instructional assistance (Bellamy, Horner, & Inman, 1979). Preferred items were also available if the participant (a) reached for the item, (b) displayed SIB or aggression, or (c) performed an al-

Table 1
Summary of Features and Contingencies for Each Phase

	Phases				
	Task R+/want	No task R+/want	Task R+/escape	No task R+/ escape	Want training
Features					
Task type	easy	easy	difficult	difficult	new easy
Preferred items	present	present	absent	absent	present
Contingencies					
Correct R	praise	praise	praise	praise	praise
Incorrect R	repeat trial/more assistance	repeat trial/more assistance	repeat trial/more assistance	repeat trial/more assistance	repeat trial/more assistance
End of trial	preferred item	no item	escape	no escape	no item
SIB or aggression	preferred item	preferred item	escape	escape	prompt
Reach for item	preferred item	block/redirect	NA	NA	block/prompt
Alternate mand	preferred item	preferred item	escape	escape	preferred item

ternative mand (e.g., request). Each of these three events also terminated the trial.

No task R+/want. This phase replicated the task R+/want procedures except (a) access to preferred items was not available following completion of task trials, and (b) reaching for the preferred items was physically blocked with the trainer providing redirection to the task. Only SIB or aggression or alternative mands resulted in access to preferred items.

Task R+/escape. Difficult tasks were presented in this phase, and escape from the task was provided after each trial. Escape for Brandi and Jamie was provided in the form of a 30- to 40-s break. For Dawn, escape was provided by presenting a new trial with sufficient trainer assistance to elicit correct responding. Preferred items were not present, and Brandi, Dawn, and Jamie received 20, 40, and 20 training trials per session, respectively, following the same training schedule used in task R+/want. Escape was also contingent upon SIB or aggression or alternative manding (for those participants who used index cards to mand "escape," these cards were present in all task R+/escape phases).

No task R+/escape. This phase replicated the task R+/escape procedures except that escape was not delivered for completion of each trial. Escape was contingent only upon SIB or aggression or alternative manding.

Want training. The purpose of this phase was to provide systematic training in an alternative mand that was appropriate when preferred items were present. All 3 participants were taught to use the ASL sign for "want" and to look at or point to the item. Training was conducted once or twice per day in 15- to 20-min sessions. The sessions were conducted in a location that was different from the previous phases, with different easy tasks but with the same preferred items present.

Training procedures used (a) verbal and physical prompts for the alternative "want" mand, (b) delivery of praise and preferred items following alternative manding, (c) blocking reaching then prompting the alternative mand, and (d) withholding preferred items following SIB and aggression plus providing a prompt to use the alternative mand. If a participant performed an "escape" mand, it was ignored and a prompt was provided to use the "want" mand (however, this was very infrequent). Together, these procedures were designed to combine instruction on desired communication responses, reinforcement of desired communication responses, and extinction of problem behaviors.

Training was terminated when a participant met the criterion of using the alternative "want" mand on 10 trials in each of two consecutive sessions (on separate days) without SIB or aggression.

Escape training. Escape training was done in

Table 1
(*Extended*)

	Phases	
	Escape training	Delay training
Features		
Task type	new difficult	difficult
Preferred items	absent	absent
Contingencies		
Correct R	praise	praise
Incorrect R	repeat trial/more assistance	repeat trial/more assistance
End of trial	no escape	no escape
SIB or aggression	prompt	prompt
Reach for item	NA	NA
Alternate mand	escape	escape 3 trials after mand

the same location as want training, but with new difficult tasks. Each participant was taught an alternative mand to escape tasks. Brandi was taught to say "go," Jamie was taught to give the trainer a card (7.5 cm by 13 cm) with the word "break" on it, and Dawn was taught to give the trainer a similar card with the word "help" on it. Brandi and Jamie each received a 30- to 40-s break from training contingent upon the alternative "escape" mand, and Dawn was provided with a new trial and sufficient trainer support to produce a correct response.

Training procedures paralleled those used in want training: (a) Verbal and physical prompts were provided for the "escape" mand, (b) praise and escape were delivered for use of the mand, and (c) SIB and aggression were followed by a prompt to use the mand rather than by escape from the difficult task. If a participant used the "want" mand during training, an "escape" prompt was provided (however, this was very infrequent). Escape training was terminated based on the same criterion applied with want training.

Delay training. Jamie received additional escape training to build a delay between the escape mand and reinforcement. After reaching the initial escape training criterion, Jamie would present his card on every trial; this had the effect of terminating instruction. Delay training involved additional escape training sessions in which presentation of the card was followed by the statement, "OK, you may have a break, but do a little more work first." Three trials later, a 30- to 40-s break was delivered. The verbal statement was faded to "OK," and after two consecutive sessions in which there were 10 trials of presenting the card and working for three more trials, the criterion for delay training was met.

RESULTS

Results for the 3 participants are presented in Figures 1, 2, and 3. The first four phases in each experiment provide consistent assessment results. During task R+ phases when preferred items were delivered after each easy trial and escape from the task was delivered after each difficult trial, there were very low levels of problem behavior. In the no task R+ phases, the preferred items and escape were available only following problem behaviors (or alternative mands), and problem behaviors were at least four times more likely for each participant. The SIB or aggression of each participant provides a clear ABAB reversal pattern across task R+/no task R+ phases for both the want and escape conditions. These results support the hypothesis that the problem behavior targeted for each participant served two distinct functions. It must be noted, however, that the brief 10- to 20-s pause in training for Dawn when she received her necklace may have functioned as escape from training and is a confounding effect that reduces the confidence with which it can be asserted that her SIB during want conditions was maintained only by access to preferred items. At no point during the first four phases did a participant use an alternative mand.

In the fifth phase of each experiment, functional communication training was delivered for either "want" or "escape." The trials and sessions to criterion for want training, escape training, and delay training are provided in Table 2. Upon meeting the communication training criterion, the participants again were presented with the no task R+ procedures (no task R+/want for Brandi and Dawn; no task R+/escape for Jamie). The pattern

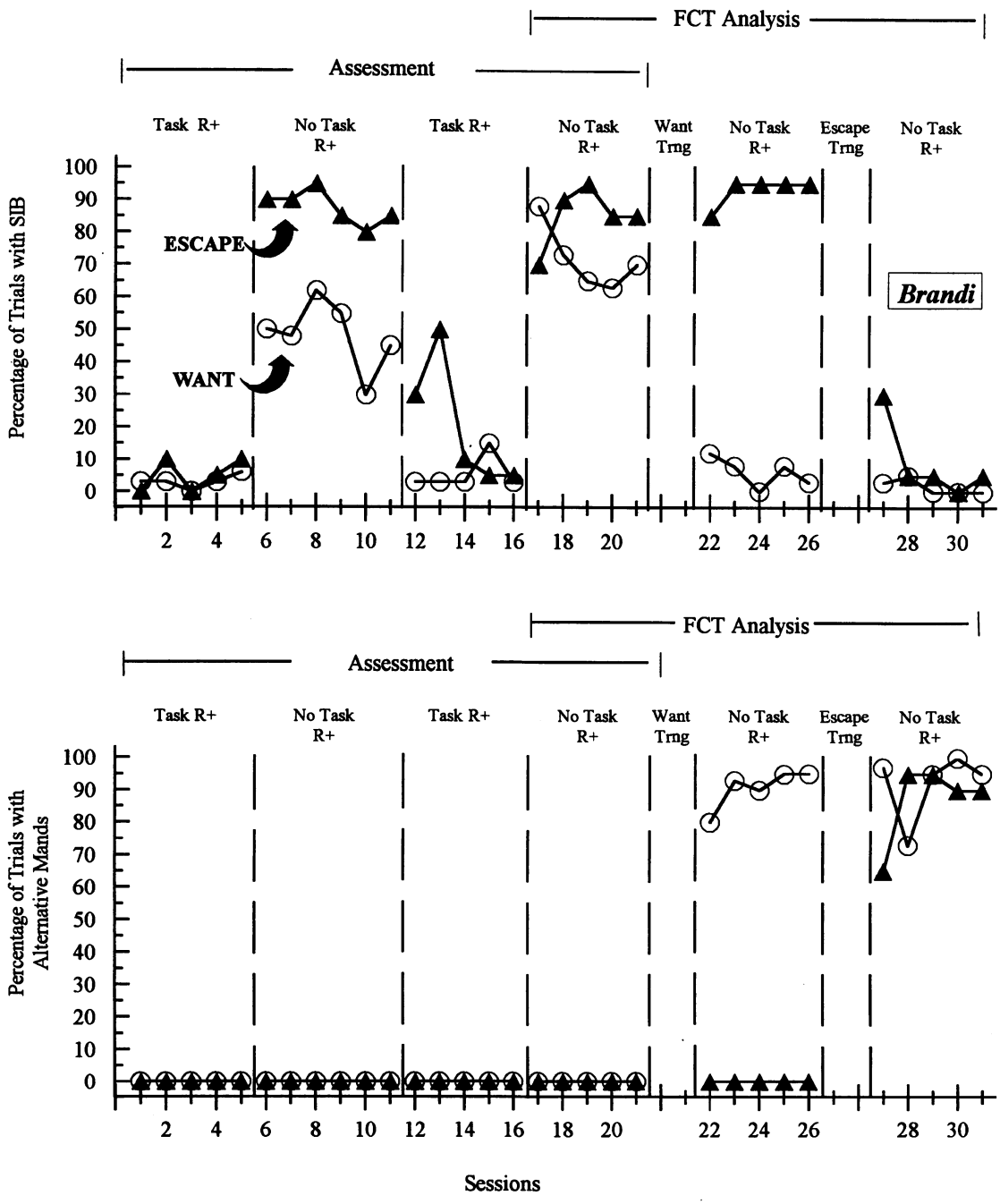

Figure 1. Percentage of trials with SIB across sessions for Brandi (top panel), and percentage of trials in which she used an alternative mand across sessions (bottom panel).

of responding was consistent across the 3 participants. In each case, there was an increase in the use of the alternative mand (M for each participant $\geq$ 46%) in the trained condition (want vs. escape) but not in the untrained condition (M = 0%). Similarly, there was a reduction to near-zero levels for problem behaviors in the trained condition and no change in the level of the problem behaviors in the untrained condition.

The seventh phase for each participant involved

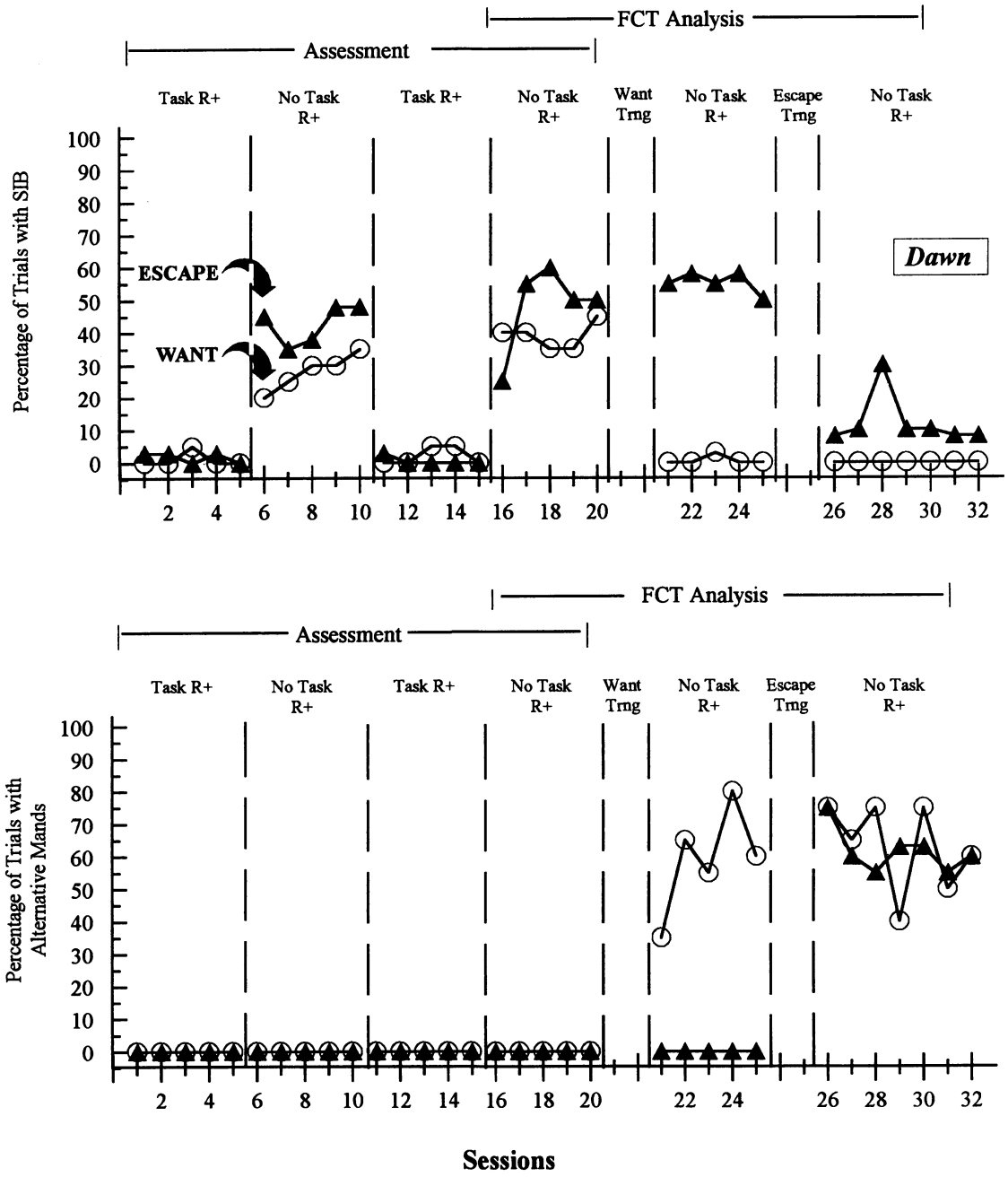

Figure 2. Percentage of trials with SIB across sessions for Dawn (top panel), and percentage of trials in which she used an alternative mand across sessions (bottom panel).

functional communication training on the second mand. Brandi and Dawn received escape training, and Jamie received want training. Upon reaching the training criterion, each participant again entered the appropriate no task R+ phases. Results for both want and escape conditions indicate that problem behaviors were at near-zero levels and that the new alternative mands were used regularly by all participants.

Jamie's data (Figure 3, lower panel) are noteworthy, given his initial increase in use of the card to an average of 85% of the trials after escape

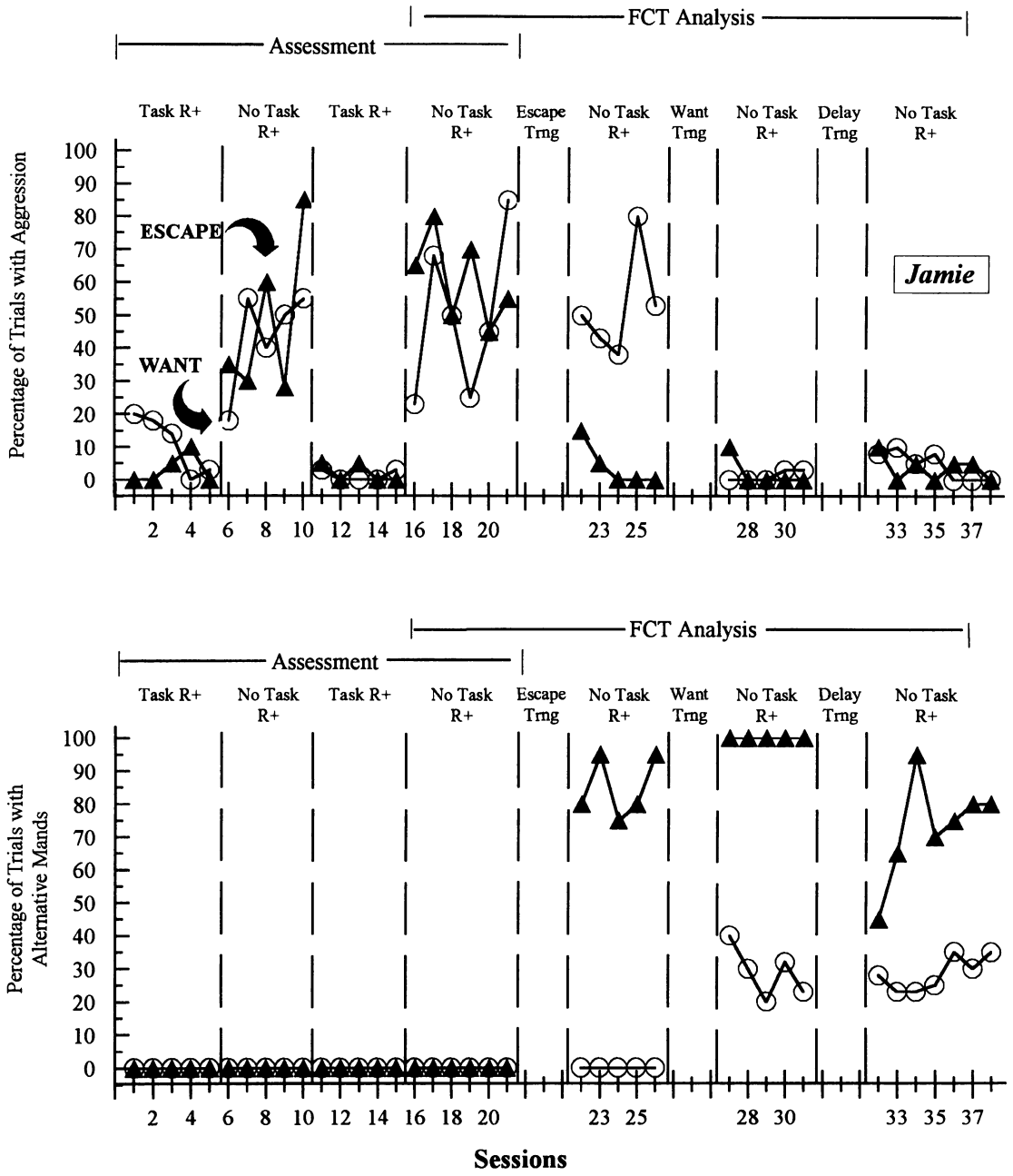

Figure 3. Percentage of trials with aggression across sessions for Jamie (top panel), and percentage of trials in which he used an alternative mand across sessions (bottom panel).

training and an average of 100% of the trials after want training. Unfortunately, use of the card on 100% of the trials meant that Jamie was not engaging in any training. When presented with a no task R+/escape trial, he would deliver his card and avoid the trial. In an effort to reengage Jamie in the training tasks, delay training was instituted. After delay training, he once again participated in training and used his card on an average of 73% of the trials.

Table 2
Training Trials and Sessions to Criterion

	Brandi		Dawn		Jamie	
	Sessions	Trials	Sessions	Trials	Sessions	Trials
Want training	2	78	9	510	5	227
Escape training	11	738	3	53	2	67
Delay training	—	—	—	—	3	210

A central assumption in this study was that tasks used during the escape condition were "difficult," whereas those used during the want condition were "easy." Results on percentage of trials correct indicate that for the escape condition, Brandi, Dawn, and Jamie averaged 1%, 21%, and 4% of the trials correct, respectively. During the want condition, respective averages for correct responding were 85%, 96%, and 86%.

Another assumption was that praise from the teacher was not a variable that systematically affected the levels of problem behavior; to control for this possibility, the teacher was instructed to praise the participant after every trial. Observation of this protocol indicated that every trial (regardless of phase) was followed by praise.

The information from these analyses has been used to redesign the ongoing clinical support for all 3 participants. One year following completion of the training phases, each of the participants was reported to continue to use his or her new communication skills and to maintain low levels of problem behavior during instruction.

DISCUSSION

The results document that problem behaviors of 3 individuals were maintained both by access to tangible objects and by escape from difficult tasks. These results join a small but important body of research emphasizing the contextual nature of behavior and documenting that problem behaviors may be maintained by multiple functions (Durand & Carr, 1992; Haring & Kennedy, 1990; Smith et al., 1993).

Conceptually, the results support our organization of behavior around functions. Skinner (1953) defined an operant as a class of responses that have a common effect on the environment, and this concept serves us well as we learn to assess the environmental variables that influence problem behaviors. The present results support a taxonomy of problem behaviors organized around functional response classes, with individual problem behaviors possibly belonging to more than one response class.

Clinically, the results have implications for the assessment of problem behaviors and our construction of intervention programs. In terms of assessment, the multiple control of problem behaviors emphasizes the need to assess behavior in contexts sufficient to identify the existence of multiply controlling contingencies. If indirect assessment procedures such as interviews, rating scales, or checklists are used (Durand & Crimmins, 1988; O'Neill et al., 1990; Willis, LaVigna, & Donnellan, 1993), care should be exercised to ensure that a wide range of establishing operations, antecedent conditions, and consequences are considered. Similarly, correlational or descriptive assessments based on direct observation of naturally occurring events (Bijou, Peterson, & Ault, 1968; Doss & Reichle, 1991; O'Neill et al., 1990; Touchette, MacDonald, & Langer, 1985) should include a full complement of observation conditions lest a constrained set of observations identify a constrained set of functions (e.g., if observations do not include situations in which difficult tasks are presented) (Sasso et al., 1992). Rigorous functional analyses (e.g., manipulations of controlling variables) in either analogue or natural settings may also need to occur with careful attention to the range of stimulus conditions that are presented. For example, identification of escape-motivated behavior may depend on presentation of the right stimulus conditions. Difficult

tasks with trainer correction may elicit very different responses than difficult tasks without trainer correction. It is possible that indirect assessment procedures may help to identify the specific stimulus conditions that will be most useful in formal functional analyses (Carr & Carlson, 1993; Mace et al., 1993; Millard et al., 1993; Sasso et al., 1992; Wacker & Steege, 1993).

The results also have implications for the construction of intervention programs. When problem behaviors serve multiple functions, the clinical program will need to have unique features to address each function (Axelrod, Spreat, Berry, & Moyer, 1993; Horner, O'Neill, & Flannery, 1993). If a program addresses only one function, we should expect the problem behavior to continue in those situations in which the second function is met.

Functional analysis is expanding our ability to predict and control serious problem behaviors. As assessment and intervention technologies continue to evolve, the complex problem presented by behaviors under multiple control will need to be addressed.

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