

A BRIEF FUNCTIONAL ANALYSIS OF AGGRESSIVE AND ALTERNATIVE BEHAVIOR IN AN OUTCLINIC SETTING

JOHN NORTHUP, DAVID WACKER, GARY SASSO, MARK STEEGE,
KARLA CIGRAND, JONI COOK, AND AGNES DERAAD

THE UNIVERSITY OF IOWA

We conducted a brief functional analysis to identify maintaining variables for aggressive behavior and an alternative replacement response during a 90-min outpatient evaluation of 3 individuals with severe handicaps. During the initial analogue assessment, which focused on identifying maintaining contingencies for aggressive behavior, each participant displayed a substantially greater frequency of aggressive behavior during one condition than during any other. The contingency that produced the highest percentage of aggressive behavior was then presented for the occurrence of a specific alternative behavior (a mand). During this contingency reversal phase, each participant displayed a substantial reduction in aggressive behavior and a substantial increase in alternative behavior, thus providing a direct analysis of the equivalency of the contingency for maintaining either behavior.

DESCRIPTORS: functional analysis, contingency reversal, outpatient assessment, aggressive behavior, severely handicapped

Based on Carr's (1977) conceptual analysis of idiosyncratic maintaining conditions for aberrant behavior, Iwata, Dorsey, Slifer, Bauman, and Richman (1982) applied the functional analysis as an assessment procedure to identify environmental variables affecting self-injurious behavior. Self-injurious behavior was measured across four distinct conditions during which environmental events were manipulated by the experimenters, including the presentation of demands, contingent social attention, noncontingent social attention, and denial of access to toys and other stimulating aspects of an environment. The results showed that within-subject variability was not random; it was consistently associated with a specific maintaining condition but

not with response topography or diagnosis. Similar findings have been reported across distinct groups of children (e.g., Carr & Durand, 1985; Cooper, Wacker, Sasso, Reimers, & Donn, 1990; Steege, Wacker, Berg, Cigrand, & Cooper, 1989).

At least three general conclusions can be reached, based on a review of the available literature. First, it has been demonstrated that self-injurious and aggressive behaviors can be lawful; they have a functional relationship to specific environmental events. Second, as proposed by Carr (1977), a number of investigators have demonstrated that these behaviors are multiply determined and there is substantial individual variability (e.g., Carr & Durand, 1985; Iwata et al., 1982; Steege et al., 1989). Finally, the substantial individual variability and the frequently equivocal results of standard behavioral treatments strongly suggest the need for individual assessment to include a functional analysis of maintaining conditions (Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990).

The majority of previous research, however, has been conducted in highly controlled, long-term inpatient settings. A functional analysis of maintaining conditions has typically involved multiple assessment sessions (e.g., 40 to 60 sessions) over an extended period of time. Although generally recognized as a superior assessment, functional analysis

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Requests for reprints should be sent to John Northup, 343 University Hospital School, The University of Iowa, Iowa City, Iowa 52242.

procedures have been characterized as complex, time consuming, and cumbersome (Axelrod, 1987; Doss & Reichle, 1989). As a result, less accurate and less reliable assessment procedures may be used (e.g., descriptive analyses, structured interviews). To provide further evidence of the utility of functional analysis as an assessment procedure for severe behavior problems, it is necessary to demonstrate the generalizability of the assessment procedures and to determine if a more brief version of assessment is feasible. If an individual functional analysis can be conducted in a shorter period of time, then many more individuals who display aberrant behavior can be assessed during a period typical of psychological evaluations in outpatient settings. Preliminary research (Cooper *et al.*, 1990) suggests this possibility with children of average intelligence who display conduct problems, but no previous studies have evaluated a brief approach to assessment of severely handicapped individuals who display severe behavior problems.

A second concern relates to selection of treatment based on the results of a functional analysis. Knowledge of a maintaining contingency does not necessarily dictate the selection of the most effective intervention. This concern with treatment selection has been discussed in terms of identifying appropriate replacement behavior (Carr & Durand, 1985). The development of a replacement response is of concern for several reasons; however, it is an essential concern for establishing the long-term effects of treatment. The development of an appropriate replacement response is particularly necessary in those cases in which the aberrant behavior serves a specific function (e.g., results in attention). Failure to provide a replacement behavior might increase the probability, by default, that another inappropriate behavior will emerge to serve the same function, especially with individuals who have very restricted repertoires of appropriate behavior.

An important question for the development of effective treatments is whether the same contingencies maintaining inappropriate behavior can be used to maintain an alternative, replacement behavior; it has not been demonstrated that a contingency identified as maintaining an aberrant behavior will also maintain alternative behavior. On a practical

level, such a demonstration would enhance the practitioner's ability to develop an effective intervention directly derived from an empirical assessment of individual maintaining contingencies. On a more conceptual level, it would be instructive to demonstrate response covariation between an appropriate and an inappropriate behavior both maintained by the same contingency.

Finally, there is a relatively small amount of research concerning persons with severe handicaps who are aggressive (Lundervold & Bourland, 1988); analyses of aggression are urgently needed, because most community placements will not accept individuals who are aggressive.

The primary purpose of this investigation, therefore, was to determine the feasibility of conducting a brief functional analysis of aggressive behavior of severely handicapped clients in an outpatient setting during a 90-min period typical of outpatient psychological evaluations. We conducted a brief functional analysis consisting of a series of analogue conditions lasting 10 min or less implemented during a 1-day outpatient evaluation.

This study also extended the procedural application of functional analyses of maintaining contingencies to include an evaluation of replacement behavior. We accomplished this by including a contingency reversal component within the 90-min outpatient assessment protocol. During the contingency reversal phase, the contingency identified as maintaining aggressive behavior was provided for an alternative replacement behavior. This component provided an analysis of the equivalency of the contingency to maintain an alternative replacement behavior as well as to maintain aggressive behavior. The results of the contingency reversal also provided an initial empirical demonstration of a potentially effective treatment.

METHOD

Participants

Participants were 3 individuals evaluated through the Self-Injurious and Aggressive Behavior Service, Department of Pediatrics, The University of Iowa. They were the first 3 patients referred to the clinic for evaluation of aggressive behavior. No other

criteria were used for subject selection. Curtis was a 24-year-old male referred by his parents for evaluation of aggression. Curtis had been diagnosed as functioning in the severe to profound range of mental retardation, was nonverbal, and displayed no formal means of communication. His aggressive behavior consisted of attempts to scratch, pinch, grab, hit, or pull hair. These behaviors were reported to occur a minimum of three times a day during the past 7 years and had been increasing in frequency and intensity during the previous 4 or 5 months. Approximately 1 month prior to evaluation, Curtis was admitted to a local hospital for 2 weeks for treatment of aggression. At that time, he was placed on tegretol and haldol, which he continued to receive at the time of our evaluation. No other formal treatment programs had been reported. Curtis was legally blind, but he presented no other medical concerns. At the time of evaluation, Curtis resided with his parents, because no group home would admit him. He had resided previously at a state institution and at a community residential facility.

Heidi was a 21-year-old female referred by the staff of her residential facility for evaluation of aggressive behavior. Heidi had been diagnosed as functioning in the severe to profound range of mental retardation, was nonverbal, and displayed no formal means of communication. Her aggressive behavior consisted of attempts to pinch, hit, or bite, and occurred as frequently as 280 times per month. Heidi also had a long history (over 10 years) of self-injurious behavior consisting of face slapping and self-pinching. The frequency and intensity of these behaviors were reported to have been quite variable, occurring as frequently as 1,200 times per month during the previous year. Approximately 2 months prior to our evaluation, Heidi was referred to a psychiatric facility for inpatient treatment of her self-injurious behavior, which was considered to be under control following discharge. Heidi presented no significant medical conditions. Previous treatments included differential reinforcement of other behavior, differential reinforcement of alternative behavior, time-out, physical restraints, and medication. At the time of our evaluation, a graduated time-out procedure was being used for ag-

gressive behavior, and Heidi was receiving thiorazine and naltrexone. Heidi resided at a large state residential facility.

Genia was a 13-year-old female with cerebral palsy, referred by her parents for evaluation of noncompliance and aggressive behavior. Genia had been diagnosed as functioning in the moderate to severe range of mental retardation, and her primary means of communication was verbal expression. A review of her records indicated that her receptive language was sufficient for basic daily needs, with expressive language abilities that allowed her to complete five- to six-word sentences; her overall intelligibility was described as being fair to good. Parental report indicated that Genia expressed a variety of requests, comments, and questions. Genia's aggressive behavior consisted of attempts to pinch, bite, and hit. These behaviors were reported to occur at least daily for the past 5 to 10 years, both at home and in school. A variety of interventions had been attempted, including redirection, time-out, and various punishment procedures. Genia resided at her parents' home.

Setting

The Self-Injurious and Aggressive Behavior Service is an interdisciplinary service located at a University Affiliated Facility (Wacker, Steege, Northup, Reimers et al., 1990). The protocol used in this investigation was incorporated into the standard evaluation conducted by the Self-Injurious and Aggressive Behavior Service. All conditions were conducted in a classroom at the hospital's inpatient unit. The classroom was equipped with a one-way mirror to permit unobtrusive observation. A lengthy questionnaire was requested from the referring agent for each participant prior to the evaluation. The referring agent was also briefly interviewed on the day of the evaluation. Specific items and materials used with analogue conditions for each participant were developed based on this information.

Response Definitions and Measurements

Response definitions. Three classes of responses were recorded for each participant: (a) aggressive behavior, (b) appropriate behavior, and (c) an alternative behavior (a mand). The topography of

aggressive behavior was individually defined for each participant. For Curtis, aggressive behavior was defined as any attempt to scratch, pinch, hit, or grab the experimenters. For Heidi and Genia, aggressive behavior was defined as any attempt to pinch, hit, or bite the experimenters.

Appropriate behaviors were defined generally as being on task, and specifically as being actively engaged with the experimenter, interacting with toys or with other materials in an appropriate manner, following directions, and engaging in any appropriate social interaction (e.g., smiling, eye contact). Appropriate behavior did not include sitting passively, staring, or posturing. Manding behavior was defined as any recognizable verbalization, manual sign, or any other clearly recognizable gesture. This response was recorded whether prompted or unprompted.

Independent variables. There were three categories of independent variables, each representing the contingent presentation or withdrawal of consequences. The three types of consequences were identified as tangibles, attention, and escape. Specific tangibles were individually identified for each participant; examples included edibles, toys, and preferred items and activities. Social attention was defined as praise, reprimands, verbal comments, or physical contact by the experimenters. Escape was defined as the termination of a task or activity contingent on any specific behavior of the participant.

Data collection. During each session, an observer recorded the occurrence or nonoccurrence of each of the three categories of participant responses. All responses were manually recorded using a continuous 6-s partial interval recording procedure. A tape recorder signaled the recording interval number at the end of each 6-s interval. All observations were conducted through a one-way mirror adjoining the classroom.

Interobserver agreement. Two observers simultaneously but independently scored all responses during 18 sessions, which constituted 90% of all sessions. The observers consisted of the authors, members of the Self-Injurious and Aggressive Behavior Service team, and graduate or undergraduate

students who had previous observer training experience in the service. Interobserver agreement data were obtained on a minimum of 57% of the sessions for every individual. Overall measures of agreement were calculated on an exact interval-by-interval basis by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100 (Kazdin, 1982). Overall interobserver agreement averaged 93% for all sessions and ranged from 71% to 100% across individuals.

Design

We used a multielement design, consisting of two rapidly changing reversal designs conducted in two phases: an initial analogue assessment and a contingency reversal. Heidi was observed during an initial analogue assessment consisting of the following four conditions: alone, tangible, escape, and social attention. Genia was observed during an initial analogue assessment consisting of alone, social attention, and escape conditions. For Curtis, the analogue assessment consisted only of alone and escape conditions. The social attention and tangible conditions were not conducted for Curtis, because he was observed to be unresponsive to social interaction and tangible reinforcement (he initially lay on the classroom floor and physically resisted any attempts to engage him in activities or physical contact), and this observation was consistent with referral information.

Following the initial analogue assessment, all participants were observed during three additional conditions, referred to as a contingency reversal. In the first contingency reversal condition, the contingency producing the highest percentage of aggressive behavior during the analogue assessment was again presented, but the consequence was provided contingently upon the occurrence of appropriate manding rather than for aggressive behavior. Aggressive behavior was ignored (Heidi and Genia), or graduated guidance was used to redirect the participant to task (Curtis). This condition was followed by a control condition, which was either a complete reversal in which the condition producing the highest percentage of aggressive behav-

ior during the initial analogue assessment was repeated (Heidi and Genia) or the alone condition was repeated (Curtis). The control condition was then followed by a second contingency reversal condition to form a reversal design.

Procedure

Prior to each evaluation, all referral information was reviewed, responsibilities were identified for each team member (i.e., data collection, therapist, parental interview), the appropriate assessment protocol was selected, and the order and type of assessment conditions were determined. Preferred items or activities were selected for the tangible conditions based on referral information, questionnaire data, and interview. Similarly, a task was selected for the escape condition based on actual tasks and demanding situations required of the participant locally. Only tasks considered to be functional, age appropriate, and challenging for the individual were selected for this condition.

Analogue assessment. For Heidi and Genia, the analogue assessment consisted of alone, tangible, demand, and/or social attention conditions, based on the analogue conditions used by Iwata et al. (1982) and Carr and Durand (1985). During these conditions, the presentation of any consequence was always contingent upon the occurrence of aggressive behavior. All sessions lasted from 5 to 10 min, with a brief (1 to 2 min) break between each session during which the experimenter left the room and briefly reviewed the condition for the next session. All sessions began with the alone condition; the subsequent sessions occurred in a counterbalanced order. For Curtis, the analogue assessment consisted of alone, escape, alone, and escape conditions for the reasons previously discussed.

During the alone condition, the participant was directed to the classroom and was given the instruction to "wait." The therapist then left the room and had no further interaction or contact with the participant. In the classroom, a variety of toys and materials were accessible; however, no specific tasks or activities were directly provided to the participant. The alone condition served as a baseline for the other three conditions; that is, the presence

of the therapist, the absence of preferred items, the absence of social attention and interaction, and the absence of demands were compared with this condition.

For the social attention condition, a therapist was present in the room and maintained a proximity of approximately 1.5 to 3 m to the participant at all times. The therapist interacted and attended to the participant contingent upon the occurrence of aggressive behavior, but otherwise ignored the participant. Typically, the therapist was seated and appeared to read a magazine or complete paperwork. Although no specific tasks or activities were provided, the participant could engage freely in activities and move about the room. Contingent upon the occurrence of aggressive behavior, the therapist immediately provided attention to the participant for 10 to 15 s. Attention consisted of verbal reprimands (e.g., "Please don't do that"), a light touch on the shoulder, and continued social interaction for as long as aggression occurred. All other responses, including appropriate and manding behavior, were ignored.

During the escape condition, the participant was seated at a table, and the therapist presented the task of folding and sorting towels and washcloths (the same task was selected for all 3 participants). Verbal instructions and modeling of the task were provided initially, followed by graduated guidance for incorrect or incomplete task responses. The task was presented continuously at a stable rate throughout the condition, unless aggressive behavior occurred. Contingent upon the occurrence of aggressive behavior, the task was immediately removed, and the therapist turned or moved away from the participant for 15 to 30 s or until the participant discontinued his or her display of the behavior, at which time the task was immediately reinstated. No verbal praise was provided for correct performance, and all interactions were limited to providing task instructions and prompts. Neutral and appropriate responses were ignored.

In the tangible condition, the therapist remained in the room and maintained a proximity of 1.5 to 3 m to the participant. Contingent upon the occurrence of aggressive behavior, the therapist im-

mediately presented the tangible item for approximately 15 to 30 s. All other responses were ignored, and the therapist engaged in no other interaction with the participant.

Contingency reversal. Three additional conditions immediately followed the completion of the analogue assessment phase. The contingency reversal phase began with the condition that produced the highest percentage of aggressive behavior during the analogue assessment. However, rather than being presented for aggressive behavior, the contingency was now presented for the occurrence of a specific manding response, which was modeled several times for the participant at the beginning of the condition. For Curtis and Heidi, the alternative behavior was the display of the "please" sign. This sign was modeled and physically prompted approximately every 30 s. The consequence was delivered whenever the sign was emitted independently or whenever the participant did not resist the physical prompt. For Genia, the alternative behavior was verbally stating, "Come here, please." At the beginning of each contingency reversal condition, Genia was given the verbal instruction, "If you want to talk to us, just say, 'Come here, please.'" No other prompts were given.

Following this condition, a reversal was achieved by repeating the condition from the analogue assessment that produced the highest percentage of aggressive behavior (Heidi and Genia) or the alone condition (Curtis). For Heidi and Genia, the consequence was again provided contingently upon the occurrence of aggressive behavior. As before, all other appropriate or neutral behaviors (including use of the alternative, replacement behavior) were ignored. This condition, conducted for 5 min, provided both a replication of the analogue assessment condition and a reversal within the contingency reversal phase. Following this reversal, the contingency reversal condition was repeated. For Curtis, the alone condition was repeated because of the intensity of his aggressive behavior displayed during the analogue assessment (one of the therapists had been bruised). The alone condition provided an adequate control for his display of inappropriate behavior and the "please" sign, and thus was considered sufficient for the evaluation.

For Curtis, the consequence during the contingency reversal condition was escape. For Heidi, the consequence during the contingency reversal was a preferred tangible item, and for Genia, the consequence was social attention. For Curtis, the same task, folding towels and washcloths, was presented in the same manner as in the analogue assessment. However, after approximately 30 s, he was prompted to use the "please" sign. Prompting following a least-to-most restrictive prompt sequence, beginning with a verbal instruction and ending with complete physical guidance. Prompts continued to be provided approximately every 30 s. Contingent upon each occurrence of the "please" sign (prompted or independent), the task was immediately removed, and the therapist turned or moved away from the participant for 15 to 30 s. All occurrences of aggressive behavior resulted in graduated guidance to redirect Curtis to the task. For Heidi, the same procedures were followed; the tangible item was presented contingent upon occurrence of the "please" sign, and all aggressive behavior was ignored. For Genia, social attention was provided for 15 to 30 s contingent upon her stating, "Come here, please," and aggressive behavior was ignored.

The contingency reversal sessions provided a direct analysis of the contingency for appropriate and inappropriate behavior. If the frequency of use of the alternative, replacement behavior (use of the "please" sign or stating, "Come here, please") increased and the frequency of aggressive behavior decreased during these conditions, a potentially effective treatment intervention was available based directly on the assessment data.

RESULTS

The results of the analogue assessment and contingency reversal phases for each participant are displayed in Figures 1, 2, and 3, respectively. During the initial analogue assessments, each of the participants displayed a greater percentage of aggressive behavior during one maintaining condition than during any other.

Curtis displayed aggressive behavior during the escape conditions only. Because the tangible and social attention conditions were not conducted, Cur-

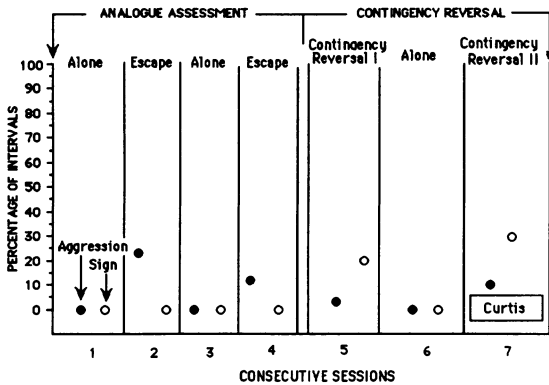


Figure 1. Performance of Curtis across conditions during the analogue and contingency reversal phases of assessment.

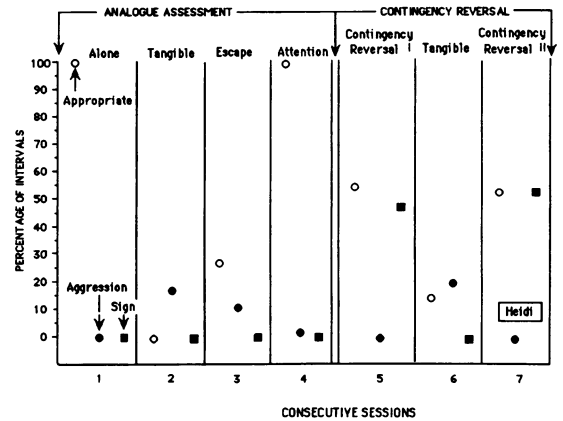


Figure 2. Performance of Heidi across conditions during the analogue and contingency phases of assessment.

tis was observed during additional alone and escape conditions. The results of these two additional conditions provided both a partial replication of the results of the first escape condition and a reversal in performance across conditions.

Curtis displayed no aggressive, appropriate, or manding behavior during either alone condition. Instead, Curtis sat or stood passively with little movement, although he occasionally engaged in some posturing behavior. During the escape conditions, physical guidance was used to attempt to engage Curtis in the task of towel folding. Most interaction consisted of providing physical guidance to attempt to position him at the work setting; he never participated in completing the task. Although prompted and unprompted signing were not recorded separately, anecdotally it was noted that all signs for Curtis were prompted, but there was some increased participation as the sessions progressed. In the first escape condition, Curtis displayed aggressive behavior during 23% of the recorded intervals. In the second escape condition, Curtis displayed aggressive behavior during 12% of the intervals. However, the intensity of his aggression during both conditions was sufficient to cause bruising to an experimenter.

For Curtis, the consequence of the contingency reversal conditions was escape from task demands. The contingency reversal conditions substantially reduced the frequency of occurrence of Curtis' aggressive behavior, which decreased to 3% and 8%, respectively. Of equal importance, aggressive be-

havior was of low intensity and frequently consisted of only light taps on the therapist's back.

Curtis' use of the "please" sign increased substantially, from 0% during the analogue assessment to 20% and 32%, respectively, during the contingency reversal conditions. Curtis continued to display no appropriate behavior other than signing; that is, at no time did he actively participate or cooperate with the completion of the task. However, it was anecdotally noted that Curtis became increasingly less resistant during the contingency reversal conditions. A replication of the alone condition resulted in an immediate return to 0% occurrence of all target behaviors.

Heidi displayed aggressive behavior during the tangible and escape conditions only. In the tangible condition, she displayed aggressive behavior during 17% of the intervals, whereas in the escape condition, she displayed aggressive behavior during 13% of the intervals. Although the percentage of occurrence was highest during the tangible condition, the relatively high percentage of occurrence during the escape condition suggested that Heidi's aggressive behavior may have served multiple functions; that is, it functioned to obtain access to preferred items in some situations and to escape from undesirable tasks or activities in other situations.

Heidi displayed some appropriate behavior during the analogue assessment. In the escape condition, Heidi participated in completing the task during 26% of the intervals. During the alone and

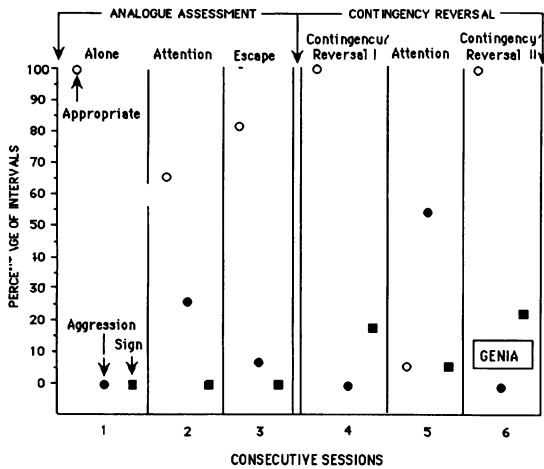


Figure 3. Performance of Genia across conditions during the analogue and contingency phases of assessment.

attention conditions, Heidi sat quietly or was actively engaged with items throughout those conditions. Heidi displayed no manding responses during the analogue assessment.

Heidi displayed no aggressive behavior during the contingency reversal conditions, compared to 17% during the analogue assessment. In addition, when the contingencies were again provided for aggressive behavior, her aggressive behavior increased to 20%.

Heidi's use of the "please" sign also increased substantially, from 0% during the analogue assessment to 46% and 50% during the contingency reversal conditions. Anecdotally, it was noted that Heidi began to sign independently after only two prompts. Appropriate behavior increased from 0% during the tangible condition of the analogue assessment to 54% and 50% when the same contingency was provided for use of the "please" sign and aggressive behavior was ignored.

For Heidi, the tangible condition of the analogue assessment was repeated as the control condition. The results provided further replication of the results of the analogue assessment and provided a reversal within the contingency reversal phase. During the replication of the tangible condition, aggressive behavior increased to 20%, but returned to 0% when the contingency reversal condition was reinstated. Anecdotally, it was noted that the in-

tensity of Heidi's aggressive behavior decreased in the contingency reversal conditions.

Heidi appeared to discriminate quickly the change in contingencies. During the reversal condition, her use of the "please" sign decreased to 0%, but following an initial prompt during the second contingency reversal condition, she again independently used the "please" sign to request her preferred item.

Genia displayed aggressive behavior during the escape and attention conditions. In the escape condition, Genia displayed aggressive behavior during only 6% of the intervals; however, the aggressive behavior was of sufficient intensity that it was necessary to discontinue the assessment condition for about 4 min. Following this break, Genia was instructed to return to the towel-folding task, and her behavior was appropriate for the remainder of the observation period. Genia's aggressive behavior occurred with substantially greater frequency (24% of the recorded intervals) during the attention condition.

Genia displayed some appropriate behavior during each initial assessment condition. In the alone condition, she appropriately engaged in play activities throughout the observation period. In the escape condition, she appropriately participated in task completion during 81% of the intervals. Appropriate behavior was lowest during the attention condition (65% of the intervals). Genia displayed no manding behavior during the initial assessment conditions.

Genia also displayed no aggressive behavior during either contingency reversal condition. Genia quickly followed the instructions; she stated, "Come here, please," during the first 6-s interval of both contingency reversal conditions, and she continued to request attention appropriately during 18% and 20% of the intervals, respectively. It was noted that all of Genia's verbalizations were independent following the initial instruction.

For Genia, the attention condition of the analogue assessment was repeated. Attention was again provided only upon the occurrence of aggressive behavior, and all other behavior (including the statement, "Come here, please") was ignored. Genia appropriately requested attention during the

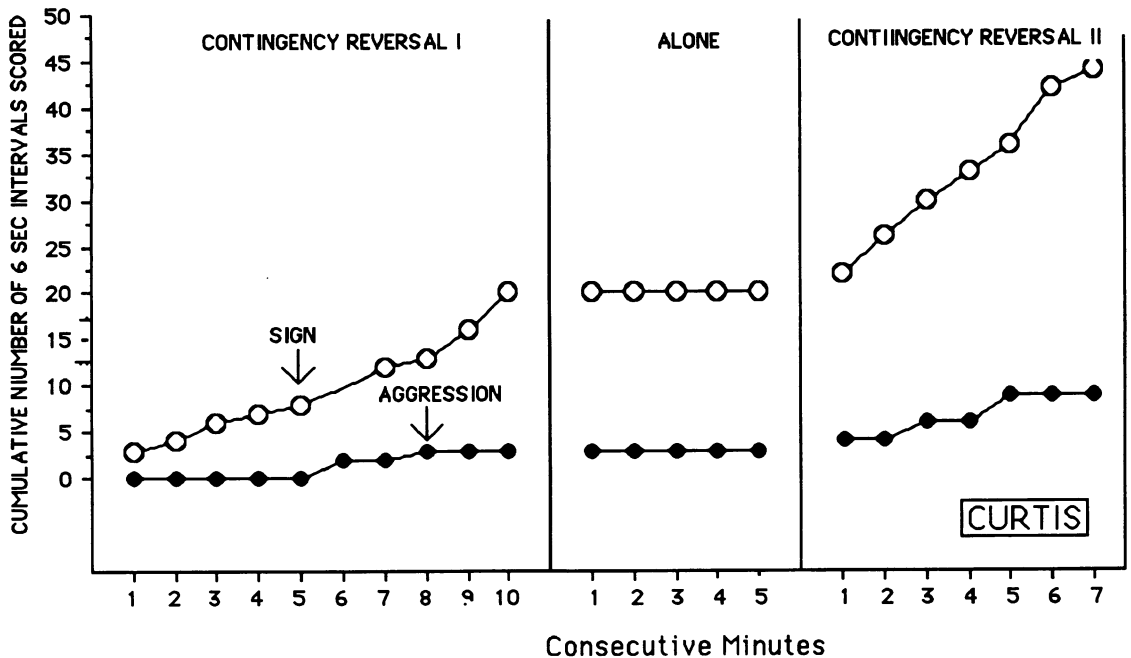


Figure 4. Minute-by-minute analysis of signing and aggression for Curtis during the contingency reversal phase of assessment.

first five intervals of the control condition by stating "Come here, please" three times. However, she then became aggressive toward the therapist and continued to display aggressive behavior throughout the observation period, during 54% of the intervals overall. In addition, her overall behavior appeared to change, and she displayed a variety of inappropriate postural or gestural movements, laughed inappropriately, and became increasingly active. These behaviors were immediately reduced when she again was provided attention for an appropriate request.

To determine whether aggressive behavior and the use of an appropriate manding response varied within as well as across conditions, a minute-by-minute analysis was conducted for the conditions in the contingency reversal phase. The number of intervals in which aggression or an appropriate manding response occurred were plotted cumulatively against time (minutes of the session). Of interest were the rate of response and change of rate occurring within conditions for each of the target behaviors. The results are displayed in Figures 4, 5, and 6.

A steep, upward increase in rate occurred immediately for the appropriate manding response that continued throughout the contingency reversal conditions for all participants. However, once the contingency was removed during the control condition, the manding response remained at 0% for Curtis and Heidi and returned to 0% after the first minute for Genia. Once the contingency was reinstated during the second contingency reversal condition, the upward trend occurred again.

For Curtis, aggressive behavior slowly stabilized during the contingency reversal conditions, and all target behaviors returned to 0% during the control condition. For Heidi and Genia, aggressive behavior remained at 0% during the contingency reversal conditions, but steadily increased during the control condition. Thus, immediate control over behavior was established in all conditions for all participants, and all trends occurred in the predicted direction.

DISCUSSION

The results of this investigation replicated and extended existing research in three ways. First, the

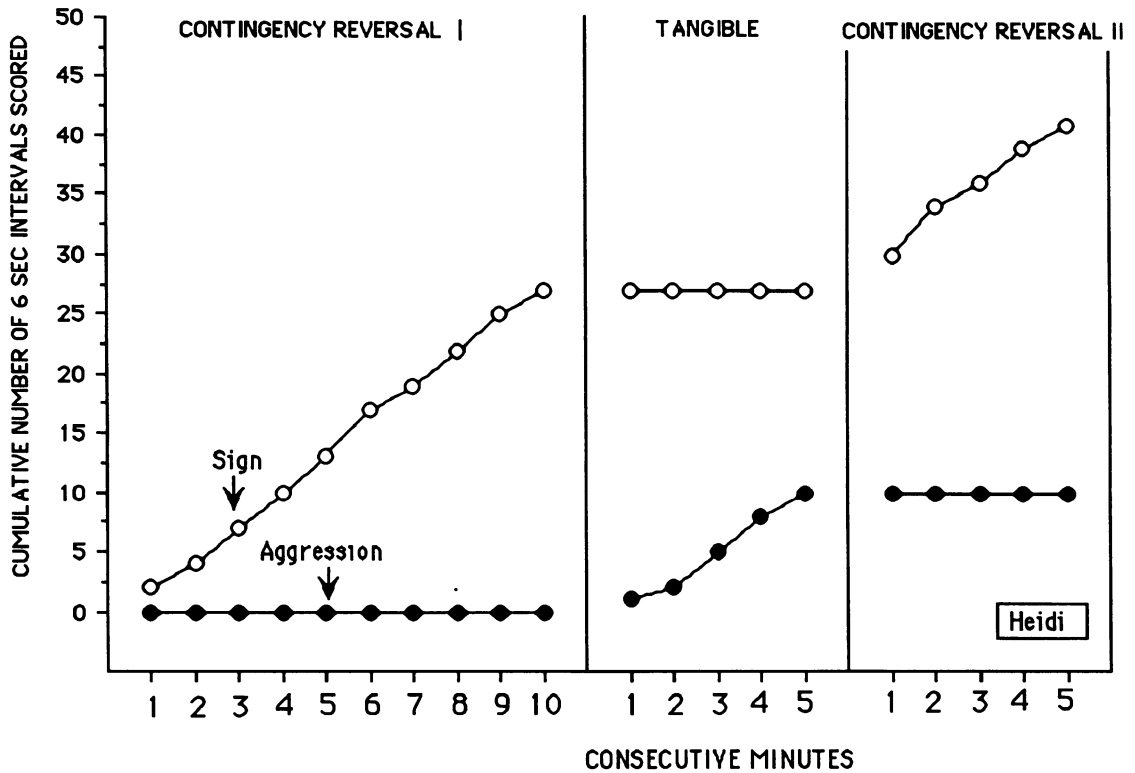


Figure 5. Minute-by-minute analysis of signing and aggression for Heidi during the contingency reversal phase of assessment.

results provided further replication of the feasibility of conducting a brief functional analysis of behavior in a setting and time frame (90 min) typical of psychological evaluations. The results of a series of brief (5 to 10 min) analogue conditions, conducted during a 90-min outpatient assessment, indicated that the aggressive behavior of each participant was associated with a specific maintaining contingency. These results, and the results of Cooper et al. (1990), suggest that functional analysis procedures used during assessment are generalizable across settings, response topographies, demographic characteristics, and maintaining conditions.

Second, these results provide additional support to previous investigations (Carr & Durand, 1985; Iwata et al., 1982; Steege et al., 1989), which suggested that (a) severe behavior disorders should not be considered only as motoric responses that can be reduced or suppressed and (b) treatment should not be selected solely on the basis of the

desired direction of behavior change. Rather, an individual assessment of the function of behavior is necessary prior to the implementation of treatment. In each case, the results of assessment were not predictable based on structural or demographic analyses of the participants, and distinct treatments were recommended based on the results of the functional analysis procedures.

Third, and most importantly from a conceptual standpoint, the results of this investigation demonstrated that the contingencies identified as maintaining aggressive behavior also served to reinforce an alternative, replacement behavior. These results are important because they provide direct evidence of the treatment utility of functional analysis as an assessment procedure (Hayes, Nelson, & Jarrett, 1987).

A distinctive feature of this study was the very rapid effects obtained during all conditions of the study and especially for the contingency reversal

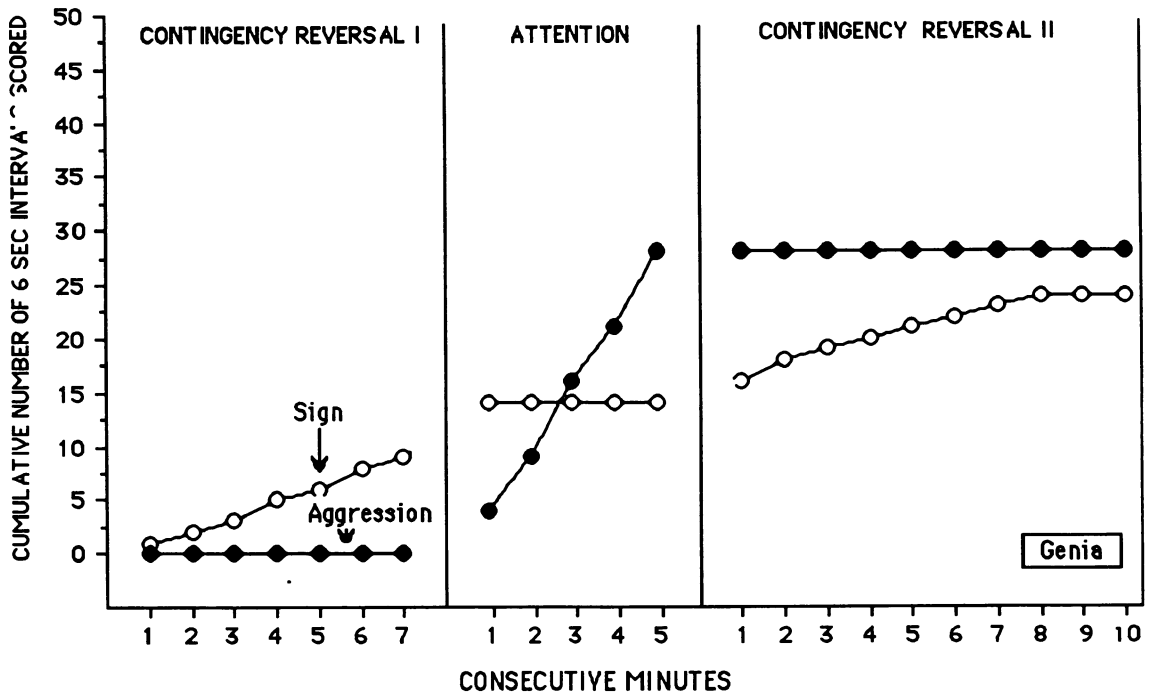


Figure 6. Minute-by-minute analysis of signing and aggression for Genia during the contingency reversal phase of assessment.

conditions; rapid effects were demonstrated for both a decrease in aggressive behavior and an increase in an alternative replacement response (a mand). There are at least four interrelated plausible explanations for these rapid results.

The first explanation involves Carr's (1988) supposition that communicative responding and some severe behavior problems may be functionally equivalent. This explanation is supported by the response covariation that occurred during the contingency reversal conditions; as manding increased, aggressive behavior decreased. If both responses (aggression and manding) result in the same outcome (i.e., are functionally equivalent), strengthening one response should weaken the other (Carr, 1988). In this investigation, Carr's supposition is supported not only by the observed response covariation, but also because the same contingency maintained both responses.

However, the inverse relationship between the mand and aggressive behavior observed in the present investigation cannot be evaluated solely in terms

of response generalization. An experimental demonstration of response generalization would require a contingency to be presented for only one class of behaviors (R1), with changes noted in another class of behaviors (R2). Such a demonstration assumes that a contingency is not presented simultaneously for both classes of behavior; that is, R2 is not directly manipulated.

In the present investigation, guided compliance was used contingently for aggressive behavior during the contingency reversal condition for Curtis, and the aggressive behavior of Heidi and Genia was placed on extinction. Thus, the contingency reversal conditions actually included at least two active treatment components: differential reinforcement of appropriate (manding) behavior and guided compliance or extinction. Although an analysis of the separate effects of each component was not conducted, it is possible that the inclusion of both components was necessary for the very rapid results obtained.

Wacker, Steege, Northup, Sasso et al. (1990)

conducted a component analysis of a functional communication treatment package in which the separate effects of a communicative (manding or activating a prerecorded message) response, guided compliance or time-out, and density of reinforcement were examined. The results indicated that guided compliance or time-out were necessary for maximal control of self-injury or aggression with 2 children. These authors further suggested that if the maintaining contingency for a target behavior was not accurately identified and actively disrupted, the response remained in the individual's repertoire along with the new alternative response and was likely to be displayed at least occasionally. However, the trained mand was also demonstrated to have a needed effect attributed to the self-scheduling of reinforcement made possible by the mand. Thus, both components were necessary for maximal control and may have been necessary in the present investigation as well.

The third explanation is that the use of contingencies for inappropriate behavior are not necessarily punishing but facilitate responding through extinction. Given that the variables maintaining a behavior are known, their removal would be expected to weaken a behavior without need for punishment or suppression of behavior with aversive stimuli (Ferster, 1961). Thus, even if guided compliance was not aversive, its use to prevent previous escape responding constitutes an extinction procedure for aggressive behavior (Iwata *et al.*, 1990). Because an additional contingency was in effect for each participant's aggressive behavior in the present study, it is reasonable to assume that the effects observed during the contingency reversal conditions, at least in part, may be attributed to extinction or escape extinction.

The fourth explanation is the dense schedule of reinforcement provided for the manding response during the contingency reversal conditions. The manding response was consistently responded to on a continuous schedule of reinforcement (CRF). A continuous schedule of reinforcement usually results in a higher overall density of reinforcement; this might have contributed to the treatment effects. Thus, increasing the density of reinforcement for

an alternative response should result in both an increase in that response and a decrease in the target behavior (Carr, 1988). In the Wacker, Steege, Northup, Sasso *et al.* (1990) study, the density of reinforcement was controlled for and the same overall amount of reinforcement was provided on a differential-reinforcement-of-other-behavior schedule during communication training, without regard to the mand. The results indicated that the density of reinforcement was an active component contributing to overall treatment effects. The continuous schedule of reinforcement used in this investigation for the mand may also have contributed to the rapid effects observed during the contingency reversal conditions. Because of the limited practicality of CRF schedules in most situations, future investigators need to determine the therapeutic validity of these procedures in applied settings.

In summary, the rapid results observed during the contingency reversal conditions may be attributed to the cumulative effects of establishing functional equivalence between the two responses, a disruption of the maintaining contingency for self-injurious or aggressive behavior, a dense schedule of reinforcement for a manding response, and the self-control of reinforcement provided by the mand.

On a practical level, the two most important findings were that (a) functional analysis techniques appeared to generalize to outclinic settings (as demonstrated by the control established over each participant's behavior), and (b) the results of the assessment were useful for prescribing specific treatments. The demonstration of the effect of the contingency reversal provided the practitioner with an empirically based rationale for initiating intervention. However, some concerns with the present study should be considered when interpreting the results.

It is of substantial concern that constructing analogue conditions in which a severe behavior might occur could place both the client and the therapist in a position of some risk. For both therapeutic and ethical reasons, this may not be tolerable for some clients with severe behavior problems. In such instances, it may be necessary to rely on more descriptive analyses conducted in the natural envi-

ronment to suggest possible functional relationships (Bijou, Petersen, Harris, Allen, & Johnston, 1969). Potential functional relationships could then be subjected to a functional analysis in which an alternative, replacement behavior being considered for use in an intervention is designated as the dependent variable.

A second limitation of the procedures used in this investigation may be the use of a generic "please" sign. Although the use of a generic sign is practical and may be essential during initial training, long-term results of the use of such a sign are unknown, and consideration should be given to implications for an overall communication program (Sigafoos, Doss, & Reichle, 1989).

We suggest that future investigators separately record prompted and unprompted mands and that their relationship to a decrease in problem behaviors receive further scrutiny. In this investigation, as well as in others (e.g., Wacker, Steege, Northup, Sasso et al., 1990), a substantial initial decrease in problem behavior occurred even when the mands were fully prompted. However, independent manding may be essential for zero rates of occurrence or for long-term maintenance.

In most previous studies, the functional analysis procedures involved repeated assessment within conditions to identify maintaining contingencies. The results of our brief functional analysis in a clinical setting may not always identify existing maintaining contingencies because we often rely on only one data point per condition. This is, obviously, not ideal. However, at the very least, if the effects of a particular consequence can empirically reduce a problem behavior and reinforce an alternative behavior, a beginning for treatment is suggested. Alternatively, one or more follow-up appointments could be requested in which our brief version of functional analysis is repeated. Such follow-ups could further verify the initial results and provide an opportunity for any necessary adjustments to the initial recommendations as well as document the initial success (or lack thereof) of the initial intervention. Similarly, it may be fruitful to repeat periodically the brief functional analysis in other settings. It should also be noted that, in our

subsequent experience, this type of brief functional analysis at times could not be conducted simply because the client did not display any problem behavior during the evaluation.

One question, then, is whether our clinical assessment should be referred to as a functional analysis per se; perhaps it is better characterized as simply being a direct or functional assessment (Wacker & Steege, in press). We deliberately avoided the term *functional assessment* because of its current widespread use in education to refer to the content of curricular or vocational programs (i.e., a functional curriculum). The term *behavioral assessment* might be adequately descriptive; however, this term has become so heuristic that it refers to a variety of direct and indirect procedures. Although it can be argued that the term *functional analysis* should only be used with experimental designs involving repeated measurements, we do not believe that such an experimental design is explicitly required by the term. If only by default, we retained the term *functional analysis* but, because of our use of limited data points, we refer to our analysis as being a *brief* functional analysis.

Although the feasibility of conducting a functional analysis within a very short time span (90 min) has been suggested by both Cooper et al. (1990) and the present investigators, the length of observation conditions and the number of observations necessary to obtain convincing results may be of some concern. The minute-by-minute analysis of Cooper et al. (1990) revealed that at least 10 min per condition are required for determining reliable effects. Future research in outclinic settings appears justified to determine further the needed length of observation conditions. Just how many observations are necessary can, perhaps, never be definitively determined, because the number and duration of observations needed to obtain a reliable picture of actual environmental events are simply unknown (Johnston & Pennypacker, 1980); or, alternatively, as Bijou et al. (1969) stated, "It depends on the data" (p. 202). Baer, Wolf, and Risley (1987) suggested that "It might prove valuable to the field to recall its original designs and their logic—a good design is one that answers the

question convincingly, and needs to be constructed in reaction to the question and then tested through argument in that context, rather than imitated from a textbook. . . . Perhaps the important point is that convincing designs should be more important than 'proper' designs" (p. 319). We believe the design used in this investigation fulfills the intent of Baer *et al.*'s suggestion. The rapid reversals obtained in response to a series of changing conditions provide what we believe is both a convincing demonstration of the effect of the changed contingencies and a practical, cost-efficient application of functional analysis procedures to an outpatient setting.

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