ASSESSMENT AND TREATMENT OF OBJECT MOUTHING

IN THE CLASSROOM

THESIS

Presented to the Graduate Council of the
University of North Texas in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Stacie Naftolin, B.S.
Denton, Texas
August, 1997
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The object mouthing of a developmentally delayed 8-year-old girl was assessed and treated in a classroom setting. Two pretreatment assessments were conducted: A functional analysis indicated that object mouthing occurred across test conditions and persisted in the absence of social contingencies, and assessment of stimulus preference identified reinforcers to be used during treatments. Based on assessment outcomes, two treatments were implemented. Noncontingent sensory reinforcement was implemented during free-time and group activities, resulting in a 74.3% decrease in object mouthing across three settings. During one-on-one educational activities, presentation of academic task-trials at a high rate decreased object mouthing by 85.7%, relative to a condition in which tasks were presented at a slower rate. Implications for the use of behavioral interventions in classroom settings are discussed.
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INTRODUCTION

Educators and other school personnel are sometimes challenged by students who exhibit behavioral difficulties that are incompatible with and disruptive to the ongoing activities and structure of a school setting. Often these behaviors are resistant to conventional methods of classroom management (Kern, Childs, Dunlap, Clarke, & Falk, 1994). Over the past decade, procedures for managing desirable and undesirable behaviors have been refined through the development of individualized functional analyses designed to determine the operant function of problem behavior (Dunlap et al., 1993).

Carr (1977) proposed that some treatment failures noted in the literature may have been due to an inadequate understanding of the environmental variables maintaining problem behavior. He suggested that maladaptive behaviors may be reinforced through extrinsic sources (e.g., through positive reinforcement such as attention, or negative reinforcement such as escape from demands), or intrinsic sources (e.g., sensory stimulation). Further, he suggested that identification of the reinforcers maintaining such behaviors could lead to the development of more effective treatments.

Functional Analysis

The authors repeatedly exposed subjects to conditions designed to simulate contingencies suspected of maintaining this problem behavior in the natural environment (e.g., contingent attention, contingent escape from tasks, and no socially mediated consequences for problem behavior). By observing the effects of these "analog" conditions on behavior, maintaining variables could be identified, and treatments could be developed based on the function of the behavior.

Variations of the Iwata et al. (1982/1994) methodology have been used to determine the variables maintaining unusual speech (Mace & Lalli, 1991); aggression (Northup et al., 1991); hand mouthing and pica (Favell, McGimsey, & Schell, 1982; Goh et al., 1995); and aberrant behavior in school settings (Dunlap et al., 1993; Lalli, Browder, Mace, & Brown, 1993; Sasso et al., 1992).

Vollmer, Marcus, Ringdahl, and Roane (1995) described a refinement of analog experimental analyses that may be especially useful in clinical and applied settings. This model (a) reduces the overall observation time of some assessments, and (b) increases the likelihood of identifying behavioral functions. In this model, assessment is conducted in a sequence of phases according to the following criteria: (a) a given assessment is conducted until differentiated response patterns are produced or undifferentiated patterns are stabilized using appropriate experimental designs, and (b) assessment is completed as quickly as possible given the constraints of the first criterion. If differentiation occurs during any phase, treatment is implemented. If there is no differentiation, the next phase is conducted.
Phase 1 of the model involves inspection of within-session data analysis to identify response patterns suggesting behavioral function. Minute-by-minute response frequencies are examined to identify patterns of extinction or acceleration. This use of within-session data analysis across alternating conditions is the first step in determining behavioral function. If this brief assessment produces conclusive results, treatment is developed; if not, participants are exposed to experimental conditions in a more extended multielement format (Phase 2) until response differentiation is achieved. If Phase 2 produces differentiated outcomes, then treatment is developed based on behavioral function. Inconclusive outcomes during Phase 2 may result from several different factors, including (a) a failure to establish discriminative control by experimental conditions, (b) interaction effects across conditions, (c) multiply controlled behavior, and/or (d) behavior that is maintained in the absence of social contingencies.

One way to test whether undifferentiated responding is a result of nonsocial maintaining variables is to observe the participant in an alone, or no interaction condition for extended periods (Phase 3). That is, the subject is exposed to a series of extended sessions during which no social contingencies are arranged for problem behaviors. If the behavior is maintained by social consequences, it should extinguish. However, behavior that is maintained by nonsocial consequences should persist at levels similar to those observed during the multielement assessment (Vollmer et al., 1994). Phase 4 is implemented only if behavior extinguishes during the repeated no-interaction conditions. This phase involves observing the subject in sequential
exposures to each of the functional analysis experimental conditions in a reversal design. If the fourth phase produces differentiated outcomes, participants proceed to treatment based on identified behavioral function (Vollmer et al., 1995).

**Automatic Reinforcement**

Functional analysis enables the service provider to develop more effective treatments, because maintaining variables can be identified and rearranged to reduce the likelihood of problem behavior while reinforcing appropriate behavior (Iwata et al., 1982). However, assessing and treating problem behavior maintained independently of social consequences is complicated by several issues. For example, the specific reinforcer maintaining problem behavior may be difficult to identify when it is not mediated by another person (Goh et al., 1995). Vaughan and Michael (1982) proposed the term *automatic reinforcement* to describe situations in which behavior is maintained by operant mechanisms independent of the social environment and noted that "it is virtually impossible to sever the behavior from the product, and thus impossible to manipulate the variable of which the behavior is considered a function" (p. 224). Automatic reinforcement represents a special problem for researchers and practitioners in the field of developmental disabilities because when reinforcers maintaining a behavior are not within the control of the therapist or experimenter, behavior is especially difficult to assess and treat (Vollmer, 1994). A recent epidemiological analysis (Iwata et al., 1994) showed that the SIB of 41 of 152 subjects (28.3%) persisted in the absence of social contingencies. Further, nonsocial reinforcement may account for an even greater proportion of certain problem
behaviors. For example, results of functional analyses conducted by Goh and his colleagues (1995) indicated that the chronic hand mouthing of 83% of their subjects was insensitive to social contingencies.

**Noncontingent Sensory Reinforcement**

One possible treatment for automatically reinforced behavior may be noncontingent reinforcement. Luiselli (1994) evaluated the effects of noncontingent sensory reinforcement on stereotypic behaviors. Two behaviors targeted for assessment and treatment were object grabbing and object mouthing. During baseline an interruption-and-removal procedure was implemented for the two target behaviors. In the treatment condition, the subject was given continuous, noncontingent access to sensory reinforcement, by allowing her to place a “chewstick” in her mouth. The chewstick was selected by the occupational therapist who determined it did not pose any physical harm, could not be swallowed, and was completely safe for its intended purposes. At any time during a session, the subject could choose to place the chewstick in her mouth, remove it, or leave it nearby. If object grabbing and object mouthing occurred during treatment sessions, the instructor responded as during baseline sessions. Results indicated that rates of responding for both targeted behaviors decreased to near-zero levels following the implementation of treatment. This study incorporated sensory reinforcement as a treatment component, indicating its potential relevance for persons for whom social stimuli are not functionally reinforcing. However, no pretreatment assessment was conducted showing mouthing to be automatically reinforced. Also, no assessment of stimulus preference was
conducted to determine whether the chewstick would function as a potential reinforcer. Thus, the behavioral mechanisms responsible for treatment effects are somewhat unclear.

Favell et al. (1982) found that making leisure materials accessible to their subject reduced hand mouthing from 56% of intervals in baseline to 11% of intervals when preferred leisure materials were available. Realon, Favell, and Cacace (1995) replicated this study and found that hand mouthing was reduced from 47% during baseline to 1.7% when selected materials were available. Again, no pretreatment assessment was conducted showing mouthing to be automatically reinforced, although the authors stated that "subjects were observed to display the behavior when alone and unoccupied and appeared calm and indeed happy while doing so" (p. 86).

Assessment of Stimulus Preference

Results of these studies suggest the importance of identifying preferred stimuli to use in reinforcement-based treatments for problem behavior. Several methods have been developed for identifying stimulus preference for individuals with developmental disabilities. Pace, Ivancic, Edwards, Iwata, and Page (1985) developed an assessment in which subject approach responses to individually presented stimuli were measured. In this procedure, the experimenter presented a single stimulus to the subject. If the subject made an approach response within 5 s, the subject gained access to that stimulus for an additional 5 s. If the subject did not make an approach response within the 5 s, the occasion to respond was removed and the subject was prompted to sample the item. A second trial was then conducted; if an approach response
occurred, 5-s access to the stimulus was provided. If the subject did not respond in
the 5 s, the stimulus was removed and the next stimulus was presented. Those stimuli
that occasioned approach responses on more than 80% of trials were labeled highly
preferred stimuli. Contingent use of these preferred stimuli increased the occurrence
of target behaviors relative to conditions in which nonpreferred stimuli or no
consequences were presented.

Fisher et al. (1992) extended the Pace procedure to offer greater selectivity in
differentiating between preferred and nonpreferred stimuli. In this forced-choice
assessment, stimuli similar to those assessed in the Pace et al. (1985) were presented
in pairs. Each stimulus was paired once with every other stimulus in a randomized
order. In each trial, two stimuli were presented to the subject. Approach to one of the
stimuli resulted in access to that stimulus for 5 s and removal of the other stimulus.
Simultaneous approaches to both stimuli were blocked. If no approach response was
made within 5 s, the experimenter prompted the subject to sample each stimulus for
5 s. After sampling each item, the two stimuli were placed in front of the subject for
another 5 s. Approach to one of the stimuli resulted in access to that stimulus for 5 s
and removal of the other stimulus. If no approach response was made to either item
within 5 s, both item were removed and the next trial began. This forced-choice
presentation format may better differentiate preferred from nonpreferred stimuli than
does the Pace et al. (1985) procedure, because it more closely approximates natural
situations in which an individual chooses between concurrently available stimuli
through differential responding.
Steege et al. (1989) combined reinforcer assessment and functional analysis to develop a treatment plan for a student's SIB. During the assessment of stimulus preference, a radio and a fan were identified by the classroom teacher as being potential reinforcers. The items were placed on the student's wheelchair tray. The student was prompted to "Press the switch" at the beginning of each session. Switch presses activated the items. The cumulative duration of microswitch activation was measured. Presentation of the stimuli was counterbalanced. Functional assessment of self-injury involved observations of the student during solitary toileting and solitary positioning conditions. These conditions were selected because the teacher had reported high rates of hand mouthing whenever the student was alone. A vocational task was selected as a control condition because the teacher had reported no instances of hand mouthing during this activity. The percent of occurrences of SIB in each condition were measured. The first three observations in each condition served as the behavioral assessment of self-injury (Steege et al., 1989). Treatment of self-injury involved using the microswitch to activate stimuli that had been identified during the reinforcer assessment. Results of the study indicated that providing the student with a method for appropriately receiving the preferred stimuli (i.e., through the activation of the microswitch), resulted in increases in microswitch activation and decreases in the frequency of SIB.

In the aforementioned study, functional assessment was not an experimental analysis because the variables suspected of maintaining the problem behavior were not systematically manipulated. For example, it may have been the case that SIB was
maintained by escape from toileting and positioning, rather than by nonsocial variables. Thus, treatment was not definitively associated with the function of the SIB.

**Rate of Task Trial Presentation**

A possible treatment approach for automatically reinforced behavior that persists during academic or training activities may be to alter the rate at which task trials are presented. That is, high-rate presentation of task-trials may occasion behavior (e.g., compliance) that is incompatible with self-stimulation. Studies reporting effects of task trial rate on problem behaviors have produced mixed results. For instance, Carnine (1976) examined the effects slow-rate task presentation versus fast-rate task presentation on off-task behavior (i.e., walking around, blurting out, talking, and other minor motor behavior), correct answering, and participation (responding within 1 s after the teacher’s cue to answer) of two “lowest-achieving” first-grade children. A task began when the teacher initiated an instruction and continued until she initiated the next instruction. Presentation rate was determined by pauses between trials; the delay was 5 s or more in the slow-rate condition and 1 s or less in the fast-rate condition. Results indicated that fast-rate task presentations resulted in decreases in off-task behavior and increases in participation and correct responding. Carnine (1976) suggested that there was little opportunity for the child to engage in inappropriate behavior during faster-paced presentations, in which the teacher presented a new opportunity for the child to respond immediately following the previous response. However, because no attempt was made to identify the
variables maintaining problem behavior in this study, a definitive account of these
effects is not possible.

West and Sloane (1986) also reported that fast rates of task presentations
resulted in decreases in disruptive behavior. The authors presented academic tasks
every 20 s in a fast-rate condition, versus every 60 s in a slow-rate condition. Results
indicated that fast-rate presentations resulted in lower rates of disruptive behavior than
did slow-rate presentations. Again, interpretation is limited by the absence of
information about the maintaining variables for disruption.

The outcomes of a study by Smith et al. (1995) contrast with those of Carnine
(1976) and West and Sloane (1986). Smith et al. (1995) compared the effects of two
schedules of task presentation on the percentage of task trials during which SIB
occurred. Two conditions were conducted: a high-rate condition in which 30 trials
were presented was contrasted with a low-rate condition, in which 10 trials were
presented. Trials were presented on fixed-time schedules during 15-min sessions.
SIB always resulted in escape from the current trial and compliance resulted in verbal
praise and task withdrawal until the next scheduled trial. Results of the study
indicated that for 4 out of 5 subjects, higher proportions of trials with problem
behaviors were observed during the high-rate sessions. The authors suggested that
when high rates of task presentation occasion high levels of problem behavior, it may
be appropriate to conduct training programs at a slow pace, perhaps minimizing the
motivation to escape from the training situation (Smith et al., 1995).
The purpose of the present study was to develop a comprehensive approach for the assessment and management of object mouthing behavior in a classroom setting. A functional analysis indicated that the object mouthing of an 8-year-old girl persisted in the absence of social contingencies. An assessment of stimulus preference was conducted to identify potential reinforcers to be used during intervention. Finally, two interventions were implemented. To treat object mouthing during free-time and group activities, the subject was allowed noncontingent access to a preferred sensory stimulus. The effects of fast-paced versus slow-paced task trials were then evaluated to address object mouthing occurring during habilitative and educational routines.

METHOD

Subject

Ginny was an 8-year-old girl who had a normal birth and development until she sustained burns to her leg and head trauma at the age of 6 weeks. As a result, Ginny was diagnosed with cortical blindness and developmental delay. She was referred to the study by the public school system because of chronic, high-frequency object mouthing which threatened her health and had been resistant to classroom-wide and individualized behavior management programs. Some of the objects she mouthed included rocks from the playground, light bulbs, crayons, markers, and light switches. Ginny was placed in an Adaptive Life Skills classroom for children with learning and developmental disabilities. She had a limited verbal repertoire but emitted a few words and gestures to request preferred items, bathroom breaks, and physical contact
from caregivers. Her Callier-Azusa scores estimated her level of functioning to be at the 18-month level.

**Setting**

The study was conducted in Ginny's special education classroom in a designated training area. The training area was approximately 1.5m x 2m and was located in the corner of the classroom with a window on one side and two, 5-ft partitions on the remaining two sides. A desk and two chairs were provided in the training area at all times, but toys, work, and other leisure materials varied according to experimental conditions.

**PROCEDURE**

**Response Definitions and Measurement**

The primary dependent variable during functional analysis was **object mouthing**, defined as insertion of an object past the plane of the upper and lower lips, or protrusion of the tongue out of the mouth onto the object. During each 10-min session, the duration of object mouthing was continuously recorded using data sheets designed specifically for this study. Interobserver agreement was assessed by having a second observer simultaneously, but independently, collect data during 31.4% of the sessions. Interobserver agreement was calculated by dividing each observation session into 60, 10-s intervals and dividing the smaller number of observed seconds by the larger number of observed seconds within each 10-s interval. The percentage within
each interval was then averaged across the session. Mean percentage agreement across sessions was 99.7% (range, 98.8% to 100%).

During the assessment of stimulus preference, approach responses were scored. Approach was defined as moving toward the object with the hand or body within 5 s of the first or second stimulus presentation. A second independent observer collected reliability data during 25% of the sessions. Reliability for approach was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Agreement on the occurrence of approach responses was 98.2% (range, 97.7% to 98.8%).

Behaviors scored during the assessment of the effects of noncontingent availability of sensory reinforcement were object mouthing, defined as insertion of an object, excluding the keychain, past the plane of the upper and lower lips, or protrusion of the tongue out of the mouth and onto the object; inappropriate touching of objects, defined as placing any part of the body on any object that was not a designated play item (i.e., television, computer); inappropriate touching of others, defined as placing any part of her body on the body of another person in the classroom unless instructed to do so by classroom staff; and vocals, defined as spontaneous vocalizations (i.e., not evoked or prompted by classroom staff). Observers marked the occurrence of target behaviors if they were observed at any time during continuous 10-s intervals. Data were converted to the percentage of intervals during which the inappropriate behavior occurred. Interobserver agreement was assessed by having two observers simultaneously and independently record instances
of behavior during 22.2% of sessions. Percentage agreement was calculated on an interval-by-interval basis by dividing the total number of agreements by the total number of intervals. Percentage agreement was 95% (range, 90.4% to 100%).

The primary dependent variable during assessment of the effects of the pace of task trials was duration of object mouthing. Data were also collected on percentage compliance, defined as the percentage of times Ginny complied with a request from the experimenter; and number of self-initiations, defined as the number of times Ginny emitted an unprompted task-related response. Data were continuously recorded during each 10-min session using data sheets designed specifically for this assessment. A second observer independently scored 22.2% of the sessions. For object mouthing, interobserver agreement was assessed in the same manner as described for the functional analysis. Percentage agreement was 99% (range, 97.8% to 100%). Percentage compliance was calculated by dividing the number of compliances by the total number of prompts given. Percentage agreement on compliance was calculated by dividing the smaller number of compliances by the larger number of compliances recorded by observers for each 10-min session. The percentages were then averaged across the sessions. Mean percentage agreement was 94.1% (range 88.8% to 100%). Percentage agreement for self-initiations was calculated by dividing the smaller number of self-initiations scored by the larger number of self-initiations scored for each session and multiplying the result by 100. Percentages were then averaged across sessions. Mean percentage agreement was 96.3% (range 80% to 100%).
Functional Analysis Conditions and Experimental Design

To identify environmental variables associated with object mouthing, analog baseline sessions based on procedures described by Iwata et al. (1982/1994) were conducted.

**Alone.** Ginny was observed alone in the training area in which an 8-inch black, plastic, spiral key chain (resembling a telephone cord); a purple, rubber, figure-eight exercise tube; and a black cotton belt were present. These objects were included in this condition to provide an occasion for the occurrence of the mouthing behavior. The purpose of this condition was to assess the possibility that object mouthing persisted in the absence of social consequences.

**Attention.** Ginny and the therapist were in the training area with the key chain, exercise band, belt and toys available. The therapist told Ginny “play with the toys while I do some work,” then engaged in a solitary activity (i.e., writing in a notebook). Contingent on object mouthing, the therapist approached Ginny and delivered attention in the form of social disapproval (e.g., “Don’t put that in your mouth; it isn’t good for you”) and provided brief physical contact (e.g., rub back). All other responses were ignored. The purpose of this condition was to assess whether Ginny’s mouthing was sensitive to attention as a form of positive reinforcement.

**Demand.** Ginny and the therapist were in the training area, which contained plastic forms and a form box. The task consisted of placing the forms into the form box. This task was chosen from a list of objectives from Ginny’s Individual Education Plan (IEP) that reportedly resulted in low rates of compliance.
Approximately 5 s was required to place one form in the form box. During demand sessions, Ginny was seated at the desk with her chair against the back wall. The therapist presented trials to the student approximately every 30 s using a three-prompt sequence. First, the therapist prompted Ginny to place a form in the box and allowed 5 s for her to comply. If she did not respond within 5 s, the therapist repeated the instruction and modeled the correct response. If no response occurred during this third additional 5 s, the therapist repeated the instruction while physically guiding Ginny to complete the task. If Ginny successfully completed the task following the first or second step of the three-prompt sequence, the therapist delivered social praise and the trial was terminated. If object mouthing occurred, the therapist immediately terminated the trial and turned away from Ginny until the next trial was scheduled to begin. The purpose of this condition was to assess whether object mouthing was maintained by social negative reinforcement in the form of escape from demands.

Play. Ginny and the therapist were in the training area where no instructional materials were presented; the key chain, exercise band, belt, and other toys were available to Ginny. Approximately every 30 s, the therapist delivered social attention (e.g., rubs on the back; game of patty-cake) contingent on the absence of object mouthing for 5 s. There were no programmed social consequences for object mouthing. The play condition served as a control for the other conditions. This condition provided availability of potentially stimulating materials, noncontingent social attention from the therapist, absence of instructional demands, and no attention for object mouthing.
The experimental design employed during functional analysis was based on the decision-making model described by Vollmer et al. (1995). The model helped establish an empirical foundation for determining when Ginny was ready to progress to treatment. Following inconclusive results from the brief (within-session) multielement functional analyses, Ginny was observed during extended alone conditions to determine if object mouthing would maintain in the absence of social contingencies. Based on the persistence of object mouthing, treatment was prescribed.

Assessment of Stimulus Preference

Potential reinforcers were assessed using a simultaneous choice procedure similar to that described by Fisher et al. (1992). The stimuli used in the assessment were suggested by Ginny’s teacher and her guardian, and were items that Ginny routinely contacted at school. The stimuli included an apple, a ball, a block, a piece of candy, a cookie, a doll, a carbonated drink, a Frito, a plastic keyboard, a plastic, spiral key chain, and a raisin. Item location was counterbalanced to control for position preference. The total number of approach responses for each item was divided by the total number of presentations to determine the percentage of approach responses for each item. For each trial, two stimuli were placed 0.3 m apart and approximately 0.5 m in front of Ginny. She was prompted to choose an item. Approach responses to one of the stimuli resulted in access to that stimulus for 5 s and removal of the other stimulus. If she approached both stimuli simultaneously, both objects were removed. If she did not make an approach response to either stimulus within 5 s, the therapist prompted Ginny to sample each item for 5 s. After sampling
each item, the two stimuli were re-presented for an additional 5 s. Approach
responses resulted in access to that stimulus and removal of the other stimulus. If no
response was made within 5 s, both stimuli were removed and the next stimulus pair
was presented. Each item was presented 54 times. Items chosen on more than 60% of
trials were designated as preferred.

**Noncontingent Sensory Reinforcement**

Baseline conditions consisted of three scheduled activities reported by Ginny's
teacher to occasion a high frequency of problem behaviors: math, recess and centers
(i.e., free-time). During math, Ginny was engaged in one-on-one instructional activity
in addition to group-participation activities with the rest of the class. During recess,
Ginny was outside on the playground with other children, where her teacher reported a
high frequency of object-mouthing. During center time, Ginny was allowed to move
freely about the room and engage in any task previously designated for center time.

Procedures were evaluated using a multiple baseline design across activities.

When inappropriate behavior occurred during baseline, the teacher re-directed
Ginny to another task or ignored the behavior. During treatment, Ginny was given
continuous, noncontingent access to the key chain (resembling a telephone cord),
which was identified as a preferred stimulus in the reinforcer assessment. Of the
stimuli identified as preferred, the key chain was chosen because it was portable (i.e.,
it could be taken to the playground and could be made available during various
classroom activities) and was easily administered by classroom personnel.
When the soft, spiral key chain was made available to Ginny, the choice of using or not using the key chain was hers and at any time during the sessions, she could place the key chain in her mouth, remove it, hold it, or put it down. If inappropriate behaviors were emitted during the treatment conditions, the teacher responded as during baseline. Keychain mouthing was not included in the measures for inappropriate behavior.

Rate of Task Presentation

To assess the effects of the pace of task trials on object mouthing, two conditions were conducted during 10-min sessions: A high-rate condition, in which 40 trials were presented (FT 15 s) was contrasted with a low-rate condition, in which 10 trials were presented (FT 60 s). Because mouthing was observed to vary across days, one session from each condition was presented each school day. The order in which the conditions were presented changed daily (i.e., one day the FT 15-s condition was presented first and the next day the FT 60-s condition was presented first). The task, chosen from a list of Ginny's current IEP goals, consisted of placing doughnut-shaped wooden circles onto an 8-in wooden stick.

Ginny was seated at her desk with her chair against the wall. The therapist placed the wooden circles in front of Ginny with the wooden stick in the middle of the desk. The therapist presented the task using a three-prompt sequence. The therapist gave an instruction (e.g., “Put it on”) and allowed her 5 s to engage in the task. If she did not respond within 5 s, the therapist repeated the instruction and modeled the correct response. If no response occurred following the next 5 s, the therapist repeated
the instruction and physically guided her to complete the trial. This sequence was repeated for 40 trials in the high-rate condition and for 10 trials in the low-rate condition.

RESULTS AND DISCUSSION

Functional Analysis

Figure 1 displays the results of Ginny’s functional analysis. The top panel of Figure 1 shows the outcomes of the brief assessment in which the duration of Ginny’s object mouthing was plotted for each consecutive minute of session time. Minute-by-minute analysis of the first 8 sessions revealed that object mouthing occurred throughout all experimental conditions. Close inspection of the data indicates that activities tended to disrupt object mouthing. That is, during sessions in which activities are present (i.e., attention, play and demand) durations of object mouthing were less than during alone sessions. Results further suggest that task presentation might have competed with object mouthing. During the demand sessions, Ginny mouthed objects for a total of 1094 s out of a possible 1800 s, compared to 1743 s in the alone condition, 1373 s in the attention condition, and 1282 s in the play condition.

In addition, the duration of object mouthing in the first minute of the alone condition for both sessions was low (35 s, 39 s) then increased to 60 s for every subsequent minute in the session. This suggests that Ginny may have been anticipating the delivery of punishment or attention from caregivers following object
mouthing; perhaps the first moments of alone sessions served as a "testing" time for Ginny.

Because the brief assessment did not produce differentiated outcomes, a more extended multielement assessment was conducted. The middle panel of Figure 1 shows the outcomes of the extended multielement assessment. During the multielement analysis, the mean number of seconds of object mouthing was 581 s in alone (range, 573 s to 592 s), 457 s in attention (range, 420 s to 526 s), 427 s in play (range, 242 s to 539 s) and 364 s in demand (range, 94 s to 540 s). These results indicate that Ginny's object mouthing was highest in the alone condition, but also continued to occur at high levels in all other conditions.

Because Ginny's object mouthing persisted across conditions, two extended alone sessions were conducted to determine whether responding would extinguish in the absence of social contingencies. The bottom panel of Figure 1 depicts the results of the extended alone sessions, and shows that object mouthing persisted at high levels during extended alone sessions. The number of seconds of object mouthing during these alone sessions was 3069 s out of a possible 3300 s. Based on the combined results of this series of analyses, it was hypothesized that Ginny's object mouthing was maintained, at least in part, by nonsocial contingencies.

Assessment of Stimulus Preference

Figure 2 displays the results of the assessment of stimulus preference, showing percentage of trials with approach responses for each stimulus. The drink (74%), Frito (61%), and key chain (60%) were identified as preferred stimuli. The relatively low
preference scores may have been due to Ginny’s demonstration of position preference. That is, during 73% of all presentations, she used her left hand to choose items presented on her left side. Because position of the items was counterbalanced (i.e., items were presented an equal number of times on the right and left side), any item chosen less than 50% of all presentations was determined to be a non-preferred item, and any item chosen over 60% of presentations overrode the position preference and was categorized as preferred.

**Noncontingent Sensory Reinforcement**

Figure 3 shows the results of the assessment of noncontingent sensory reinforcement. The figure displays the percentage of 10-s intervals in which inappropriate behavior occurred during math, centers and recess activities. The top panel of Figure 3 displays the percentages of inappropriate behaviors during the math activity. Data showed an increasing trend during baseline, followed by an immediate and dramatic decrease which maintained at near zero levels throughout treatment. The mean percentage of intervals during which inappropriate behavior occurred was 15.8% during baseline and 1.2% during treatment. This represents a 92.5% decrease from baseline to treatment.

The middle panel of Figure 3 displays the percentage of intervals with inappropriate behavior during center-time. In baseline, 15.8% of intervals contained inappropriate behavior, compared to 5.9% of intervals during treatment; these results represent a 62.7% decrease over baseline.
The bottom panel of Figure 3 displays the percentage of intervals with inappropriate behaviors during recess. Baseline data showed a general ascending trend, with a slight decrease in inappropriate behavior in session 7 and 8. Inappropriate behavior then rapidly decreased upon the implementation of treatment. The mean percentage of intervals with inappropriate behavior during baseline was 29.1%, compared to 8.5% during treatment. These results represent a 70.8% decrease over baseline.

Overall, results of the assessment show that noncontingent availability of the key chain decreased the frequency of inappropriate behaviors across three settings by 74.3%. These results provide support for the findings of Luselli (1994), who demonstrated the effects of noncontingent sensory reinforcement on problem behavior. The current results, evaluated in a multiple baseline design across settings, demonstrated therapeutic reductions not only in object mouthing, but also in the rate of other inappropriate behaviors, following the introduction of noncontingent access to a preferred sensory stimulus.

An issue associated with this intervention was that Ginny typically mouthed the key chain when it was available. Key chain mouthing occurred during 86.6% of intervals during math, 93.3% of intervals during centers, and 96.6% of intervals during recess. Thus, a potential concern was whether the presence of the key chain in Ginny's mouth would be socially acceptable in a school setting. Before treatment was introduced, the potential advantages and disadvantages of this treatment were reviewed carefully by educational staff and Ginny's guardians. All agreed that, given the
potential consequences of Ginny's problem behavior and the probability of success using noncontingent sensory reinforcement, this procedure represented a minimally intrusive procedure that did not interfere with Ginny's presence or performance in the classroom.

Treatment selection was based partly on the rationale that providing noncontingent access to preferred stimulation might decrease the frequencies of other targeted behaviors. Preceding treatment, it was not uncommon for Ginny to mouth an object while simultaneously grabbing or attempting to grab other objects or children in the classroom. By providing continuous, noncontingent access to a preferred stimulus, separate treatment procedures for other inappropriate behaviors were not required. This was of practical significance for treating problem behaviors in a classroom setting. Also, allowing noncontingent access to a preferred stimulus did not require additional time or participation from the teacher or other classroom personnel.

Rate of Task Presentation

Figure 4 shows Ginny's performance during FT 15-s (high-rate) and FT 60-s (low-rate) task trials. The top panel of Figure 4 shows the duration of object mouthing during both rates of task trial presentations. The duration of object mouthing during FT 60 s was variable but consistently higher than FT 15-s conditions. Initially, durations of object mouthing were variable in the FT 15-s condition, but subsequently stabilized at low values. Overall durations of object mouthing were lower during the FT 15-s conditions than FT 60-s conditions. The mean number of seconds of object mouthing in the FT 60-s condition was 134 s (range, 40 s to 201 s),
compared to 19.2 s (range, 0 s to 68 s) in the FT 15-s condition. This represents an 85.7% decrease in object mouthing from the low-rate to the high-rate condition.

The middle panel of Figure 4 shows the percentage of trials with compliance in both conditions. Initially, percentages of compliance were differentiated, with higher levels of compliance in the FT 60-s condition and lower levels in the FT 15-s condition. However, levels of compliance increased in the FT 15-s condition during the last third of the sessions. Data paths merged in session 6, showing an increasing trend in the FT 15-s condition and variable levels in the FT 60-s condition. One possible reason for increasing compliance in the FT 15-s condition may be an increased rate of prompts as well as an increased rate of reinforcement. Overall, levels of compliance were slightly higher in the low-rate condition than in the high-rate condition. Compliance was 78.8% in the low-rate condition and 67.4% in the high-rate condition.

The bottom panel of Figure 4 shows the number of self-initiated responses during both conditions. During the first 5 sessions, the number of self-initiated tasks was higher in the FT 60-s condition than in the FT 15-s condition. In the sixth session, the data paths crossed, showing higher rates of self-initiated tasks in the FT 15-s condition and lower rates in the FT 60-s condition for the remainder of the assessment. These outcomes are somewhat counterintuitive. Given the 1:4 ratio of task trials between conditions and the fact that task materials remained on Ginny's desk for the remainder of intertrial intervals, Ginny had much more "free time" (i.e., intertrial durations) during the FT 60-s condition. This provided an extended
period of time to self-initiate responses. Because of this, it is reasonable to expect that higher rates of self-initiated tasks would occur in the FT 60-s condition, compared to the FT 15-s condition. This appeared to be the case for the first 5 sessions. The subsequent increase in self-initiation in the FT 15-s condition may have been due to a "behavioral momentum" effect produced by a higher number of prompts and a greater density of reinforcement in the high-rate condition (Mace et al., 1988).

The current study supported the findings of West and Sloane (1986) and extended Carnine's (1976) finding that faster task trial presentations were associated with lower rates of inappropriate behavior than were slower task trial presentations. In this study, we attempted to reduce problem behaviors by increasing opportunities to respond to academic, habilitative tasks. This method of task trial presentations might serve as an alternative to the use of aversive consequences that are often used in classroom settings.

GENERAL DISCUSSION

This study described analysis and treatment of object mouthing in a special education classroom setting. Results of the functional analysis indicated that object mouthing persisted in the absence of social contingencies. A 2-component treatment package was implemented to treat object mouthing during free-time and group activities, as well as one-on-one instructional activities.

During free-time and group activities, Ginny was provided with noncontingent availability of a preferred sensory stimulus. Overall, object mouthing was reduced by
75% when the preferred object was available. Other inappropriate behaviors also
decreased as a result of this treatment. During instructional activities, task trials were
presented at varying rates to determine the rate of task trial presentation that
occasioned the lowest frequency of object mouthing. Object mouthing was reduced by
85.7% when task trials were presented at a high-rate.

Many teachers are discouraged by the disruptive behavior of their students
(West & Sloane, 1986). Referrals to special education programs may often be a
reaction to disruptive behavior rather than to academic deficiencies. This study
represents a function-based approach to managing inappropriate behavior in the
classroom. Further, several aspects of the current behavioral literature were integrated
in order to develop a comprehensive intervention package.

This study represents an extension of four behavioral methodologies (i.e.,
assessment of stimulus preference, functional analysis, noncontingent sensory
reinforcement, and task-trial pacing) to the classroom setting. Other studies have
reported descriptive analyses conducted in a classroom setting, but this investigation
represents one of the first studies to complete an experimental analysis of problem
behavior in a public school classroom. A function-analytic decision-making model
(Vollmer et al., 1995) was used in a classroom to verify that object mouthing persisted
in the absence of social contingencies, and served as a guide for determining the
appropriate time to implement treatment.

The assessment of stimulus preference also was integrated into the classroom
environment to prescribe classroom-based treatments. In addition to items identified
by the experimenter, teachers and caregivers nominated items to be included in the assessment, and items identified as being highly-preferred were subsequently used in treatment procedures.

Because analysis and treatment took place in the Ginny's classroom, it was possible to integrate treatment procedures smoothly into her daily routine. Increasing the rate of task presentation was an intervention that was easily implemented by the classroom teacher following the investigation. Noncontingent availability of the key chain also was easily implemented by all school personnel. As Horner (1994) stated, "The goal is not to find one true intervention, but to find an intervention that is effective and will be implemented by the people in the setting" (p. 403).

One important finding is that self-initiations decreased in the FT 15 s condition of the assessment of task-trial rate. It was hypothesized that object mouthing would decrease in this condition because there was less time to emit the behavior; however, the number of self-initiated tasks increased during this condition. Thus, faster trials appeared to alter her "choice" about what to do during the intertrial intervals. If the intertrial interval was spent doing the same thing in both conditions, then both object mouthing and self-initiations would have been lower in the FT 15 s condition. This demonstrates that faster presentations did more than simply "keeping her busy".

A limitation of this study concerns the experimental analysis of the problem behavior. Although the functional analysis provided a clear picture of the maintaining variable for object mouthing, revisions should be made to include all possible maintaining variables in a classroom setting. For example, we did not conduct a
materials condition to determine if the behavior was maintained by access to a preferred object. We also failed to evaluate potential effects of attention from peers and classroom personnel. It is likely that the maladaptive behavior of some students is maintained by peer attention; however, this was not assessed in the current study, and procedures for experimentally assessing the effects of this variable have not been developed. Future researchers should assess a greater range of possible maintaining variables in classroom settings. It may be necessary to revise analog baseline procedures in order to assess each of these potential variables without compromising experimental integrity.

Another limitation of this study was that a follow-up assessment phase was not included. Data on the long-term effectiveness of these treatment procedures are not currently available. Because her problem behaviors are threatening to Ginny’s health, follow-up data are currently being collected.

Assessment and treatment of problem behavior in the classroom can be difficult not only because the variables maintaining problem behaviors are idiosyncratic, but also because the ongoing activities and structure of a school setting fluctuate dramatically. Functional analysis and stimulus preference assessments are useful tools for determining the maintaining variable(s) of problem behavior in a classroom and for developing functionally appropriate treatments. Interventions that are conceptually sound (i.e., consistent with the results of functional analyses and our understanding of the principles of human behavior) and contextually appropriate (i.e., consistent with
the values, skills, and resources in the setting) increase the likelihood of treatment fidelity and successful behavior change in the classroom.
APPENDIX
Figure 1: Seconds of object-mouthing during the brief analysis (top panel), multielement analysis (middle panel), and extended Alone (bottom panel).
Figure 2: Results of assessment of stimulus preference, showing percentage of trials in which each item was selected.
Figure 3: Percentage of intervals with object mouthing (except keychain), inappropriate touching of objects or other persons, and inappropriate vocals across math (top panel), centers (middle panel), and recess (bottom panel) activities.
Figure 4: Results of the assessment of fast-paced (filled circles) versus slow-paced (open circles) task-trials, in which one session of each type was conducted per day. Top panel shows duration of object-mouthing in seconds, middle panel shows percentage of trials with compliance, bottom panel shows number of self-initiated tasks.
REFERENCES


