THE EFFECTS OF MOTIVATING OPERATIONS ON AUTOMATICALLY MAINTAINED CHALLENGING BEHAVIOR

Dissertation

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ABSTRACT

The current study examined the effects of four different pre-session conditions (i.e., motivating operations) on decreasing challenging behavior in four participants with developmental disabilities. There were three phases in this study. The first phase, a functional analysis, was used to confirm that each participant’s target behavior was automatically maintained. The second phase was used to determine which pre-session condition (i.e., no-interaction, attention, response blocking, or attention plus response blocking) would lead to the lowest levels of automatically maintained behavior in subsequent no-interaction sessions of a functional analysis. The third phase was used to examine whether 10 min and 5 min periods of pre-session conditions produced effects similar to the 15 min pre-session conditions during the second phase.

Results from the functional analyses suggested that all participants’ target behaviors were automatically maintained. Results from Phase 2 found that the most effective pre-session condition no-interaction for 2 participants, response blocking for 1 participant, and attention plus response blocking for the remaining participant. The results of phase 3 showed that for 3 of the 4 participants, 10 minute and 5 minute periods of pre-session conditions produced effects similar to the 15 min pre-session conditions.
Dedicated to my advisor, committee members, classmates, proofreaders, family, and friends. Every person around me plays an irreplaceable role in my life.
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CHAPTER 1

INTRODUCTION

Over the past decade, the manipulation of motivating operations (MOs) has received more attention as a treatment for challenging behavior in individuals with developmental disabilities (Wilder & Carr, 1998; Zayac & Johnston, 2008). Keller and Schoenfeld (1950) initially introduced the term establishing operations (EO) to describe events that could affect the emission of behavior. Michael (e.g., 1982, 1993, 2000) subsequently defined and discussed EOs in a series of articles. More recently, Laraway and colleagues (2003) noted that not all motivating events are EOs, and they suggested the more practical term, motivating operations. According to Michael (1992) and Laraway et al.’s (2003) description, an MO is an environmental event, operation, or stimulus condition that changes the probability of behavior via two momentarily altering effects. This definition illustrates two important defining features of an MO: (a) every environmental event, operation, or stimulus condition that functions as an MO has two effects, and (b) these effects are momentary.
By definition, MOs alter the value of a reinforcer or the frequency of a behavior. The value-altering effect involves either an increase (i.e., EO) or decrease (i.e., abolishing operation, or AO) in the effectiveness of a consequence as a reinforcer or punisher. In other words, EOs make the reinforcer or punisher more effective, while AOs make them less effective. The behavior-altering effect refers to the momentary likelihood of occurrence of responses that have previously produced the consequence. This effect can either be an evocative effect (i.e., an increase in relevant responding) or an abative effect (i.e., a decrease in relevant responding). Consider an example that includes both value- and behavior-altering effects of an MO (e.g., Fischer, Iwata, & Worsdell, 1997). If attention deprivation functions as an EO for self-injurious behavior (SIB), deprivation would be expected to increase the value of attention as a reinforcer (i.e., value-altering effect) and increase the occurrence of SIB (i.e., behavior-altering effect). In another example, if food satiation functions as an AO for aggression, food satiation would be expected to decrease the value of food as a reinforcer (i.e., value-altering effect) and also decrease the occurrence of aggression (i.e., behavior-altering effect) (Michael, 1993).

The second defining feature of an MO is that the two altering effects are momentary. In other words, once the MO is removed or reduced, the value of a given consequence may be re-established, and the frequency of behavior may return. For example, Roantree and Kennedy (2006) used an ABA design to evaluate the effects of pre-session attention on attention maintained stereotypy in a child with severe mental retardation. The results of the initial functional analysis demonstrated an undifferentiated pattern of stereotypy. Based on informal observation, however, it was hypothesized that
attention could be acting as a maintaining variable for stereotypy. To test the hypothesis, 20 min of access to positive attention was provided immediately prior to the functional analysis sessions. The results of the second functional analysis showed that stereotypy occurred more in the attention condition, but less in other conditions, which suggested that attention functioned as an EO for stereotypy. When pre-session attention was removed, an undifferentiated pattern of responding was re-established, thus illustrating the temporary influence of MOs.

In addition to the aforementioned defining features of MOs, another feature that has been discussed and studied in the literature is that multiple MOs might have effects on multiple behaviors (e.g., Goh, Iwata, & DeLeon, 2000; Horner, Day & Day, 1997; Laraway et al., 2003; Poling, 2001). Poling argued that a given MO might influence many behaviors and that a given behavior might be influenced by more than one MO. For example, Horner et al. found that sleep deprivation functioned not only as an AO for staff praise but also as an EO for challenging behavior maintained by edible items in one participant with autism and severe intellectual disabilities. In another example, Goh et al. found that a dense, time-based reinforcement schedule functioned as an AO for both challenging behavior (i.e., SIB) and desired behavior (i.e., mands).

A conceptual understanding of MOs has enabled researchers to properly identify and empirically investigate motivational variables that might alter the frequency of challenging behavior. In recent years, there have been an increasing number of theoretical and practical advances in terms of contriving MOs to eliminate socially maintained challenging behaviors. Specifically, numerous studies have focused on behavior
maintained by social positive reinforcement (e.g., DeLeon, Uy, & Gutshall, 2005; O'Reilly, Edrisinha, Sigafoos, Lancioni, & Andrews, 2006a; O'Reilly et al., 2007a), social negative reinforcement (e.g., Crokett & Hangopian, 2006; Ebanks & Fisher, 2003), or both (e.g., Kodak, Miltenberger, & Romaniuk, 2003; McComas, Thompson, & Johnson, 2003).

MO interventions for challenging behavior maintained by positive reinforcement (e.g., attention or tangible items) involve reducing the effect of the maintaining reinforcer via providing pre-session noncontingent reinforcement that might attenuate its related deprivation condition (McGill, 1999; Wilder & Carr, 1998). For example, O’Reilly and colleagues (2006b) examined the effects of pre-session attention on challenging behavior maintained by social positive reinforcement in an individual with autism and developmental disabilities. The participant’s challenging behavior, which included bizarre speech and elopement, was evaluated in three phases. The results of the initial functional analysis suggested that the target behavior was attention maintained. During the second phase, pre-session access vs. no pre-session access to attention (i.e., 15 min continuous social interaction) was provided immediately prior to the attention sessions of an analogue functional analysis. The results demonstrated that when pre-session attention was provided, lower levels of challenging behavior occurred during the attention sessions of the functional analysis (i.e., attention deprivation functioned as an EO for challenging behavior). The procedure of the final phase was identical to the second phase except that all challenging behavior was placed on extinction after pre-session conditions. The results indicated that manipulation of pre-session attention prior to extinction may have had an
evocative effect when there was no access to attention, and an abative effect when pre-
session attention was provided.

Following a functional analysis indicating that challenging behavior is maintained
by social negative reinforcement, additional analyses or assessments are still required to
further specify the stimuli that establish escape maintained challenging behavior (Crockett
& Hangopian, 2006; Ebanks & Fisher, 2003). In school settings, studies have
demonstrated that a variety of stimuli can establish escape from instructional demands as
the maintaining consequence. These stimuli included frequency of demands, task
difficulty, task materials, prompting procedures, and the pace of task presentation.
Manipulating these stimuli may be one approach to the treatment of behavior maintained
by social negative reinforcement (Carbone, Morgenstern, Zecchin-Tirri, & Kolberg,
2007). For example, Crockett and Hagopian evaluated the effects of altering the EO for
escape by withholding gestural and physical prompts on challenging behavior in a 19-
year-old male diagnosed with Nager’s syndrome, mild mental retardation, and deafness.
Instead of using a three-step prompting procedure (i.e., verbal, gestural, physical), only
one verbal prompt to start working was delivered and noncompliance did not result in
additional prompts. The results indicated that the three-step prompting procedure
functioned as an EO for challenging behavior across task sets and that manipulating the
EO using the modified prompting procedure resulted in a decrease in escape maintained
behavior and a sustained increase in compliance and task completion.

Based on the results of the studies described above, it appears that differential
effects of pre-session manipulation of the MO depend on the function of behavior. That is,
if a given behavior is attention maintained, it would be influenced by the absence or presence of pre-session attention. On the other hand, the effects of pre-session attention would be unlikely to be observed with escape maintained behavior. To further analyze whether functionally related vs. unrelated MO manipulations have an effect on socially mediated behavior, McComas and colleagues (2003) examined the effects of pre-session attention on challenging behavior maintained by attention, escape, and both with five elementary-school children with developmental and learning disabilities. The initial functional analysis (Experiment 1) showed that the challenging behaviors were maintained by attention for 2 participants, escape for 2 participants, and both attention and escape for the fifth participant. In Experiments 2 and 3, the effects of two pre-session conditions (10 min attention vs. 10 min ignore) on challenging behavior were compared in the subsequent test conditions. For participants who had attention maintained challenging behavior, the test condition involved providing attention contingent on that behavior (Experiment 2). For those participants who displayed escape maintained challenging behavior, the test condition involved providing 10 s escape contingent on the challenging behavior (Experiment 3). The fifth participant (with attention plus escape maintained behavior) was included in both experiments. The results suggested that pre-session attention decreased attention maintained challenging behavior (i.e., functioned as an AO for challenging behavior), but had no effect on escape maintained behavior for all of the participants.

Various techniques for manipulating MOs (e.g., pre-session attention, modified prompting) have been examined with individuals whose challenging behaviors were
socially maintained. Relatively little attention has been given to non-socially maintained or automatically maintained behavior. Unlike socially maintained behavior, automatically maintained behavior is a unique type of challenging behavior, because engaging in the behavior is intrinsically reinforcing (LeBlanc, Patel, & Carr, 2000). For example, a boy who has a severe developmental disability may engage in stereotypic hand flapping to access the stimulation that is directly produced by the hand flapping. Given that its maintaining variables are not mediated by social variables, it is difficult or impossible to use function-based interventions to decrease automatically maintained behavior (LeBlanc et al., 2000). However, studies have examined the effects of differential reinforcement (e.g., Ringdahl, Andelman, Kitsukawa, Winborn, Barretto, & Wacker, 2002), punishment (e.g., Ellingson, Miltenberger, Stricker, Garlinghouse, Roberts, Galensky, et al., 2000), noncontingent reinforcement (NCR) (DeLeon, Anders, Rodriguez-Catter, & Neidert, 2000), environmental enrichment (EE) (Ringdahl, Vollmer, Marcus, & Roane, 1997), (Rapp, 2004), and treatment package (e.g., Carr, Dozier, Patel, Adams, & Martin, 2002) on automatically maintained challenging behavior.

For example, Ringdahl and his colleagues (2002) evaluated the effects of differential reinforcement of other behaviors (DRO) on the hand flapping of a 15-year-old boy with mild mental retardation and a seizure disorder. The researchers used an ABAB design to examine the effects of a DRO intervention in which the participant was given access to a preferred stimulus after not engaging in hand flapping for a predetermined amount of the time. When the DRO intervention was implemented, hand flapping immediately dropped from an average of 78% to 0% and maintained. His hand
flapping increased to 83% of intervals when baseline was reintroduced and immediately returned to 0% when the intervention was reinstated.

Vorndran and Lerman (2006) examined the effects of pairing a less intrusive punisher with a more intrusive punisher on the challenging behavior of two individuals with severe mental retardation and cerebral palsy. One participant engaged in chronic hand mouthing and the other participant engaged in hyperventilation. A multiple-baseline across settings with an embedded reversal design was used to demonstrate the long-term effects of the less intrusive punisher for both participants. For one participant, the intervention led to immediate decreases in hyperventilation and the effects were maintained during a seven-month follow-up with novel therapists. For the other participant, the pairing procedure was effective at reducing hand mouthing; however, extended pairing sessions were required to maintain low levels of the challenging behavior.

In the literature, NCR, EE, and satiation procedures were three commonly used interventions that focused on MO manipulations (Wilder & Carr, 1998). These MO-related interventions all involve minimizing the value of the consequences that were produced by engaging in automatically maintained behavior. NCR interventions for automatically maintained behavior are done by providing preferred stimuli that seem to match the sensory reinforcer generated by that behavior. DeLeon and colleagues (2000) conducted a study to examine the effects of noncontingent access to single- vs. multiple-stimulus sets on SIB in an 11-year-old girl with autism and moderate mental retardation. The results of the functional analysis showed that SIB was maintained by automatic
reinforcement. Compared to other social conditions, no SIB was observed during the play condition of the functional analysis when toys were provided. Therefore, it was hypothesized that providing noncontingent access to a single set of preferred toys (NCR) could effectively reduce the behavior. A multi-element design embedded in a reversal design was further used to evaluate the effects of noncontingent access to single- vs. multiple-stimulus sets on SIB. The results suggested that the single set of toys might create satiation and that rotating toy sets or providing access to multiple toy sets had relatively long-lasting decreases in SIB.

EE interventions for automatically maintained behavior involve enriching a deprived environment that might increase the latter engagement of the behavior. Ringdahl et al. (1997) examined the effects of EE on SIB in three children with developmental disabilities. The initial functional analyses showed that all participants’ SIB was maintained independent of the social consequences. A free-operant preference assessment then was used to identify stimuli that might compete with the consequences generated by engaging in SIB. The results suggested that 2 participants selected preferred stimuli over aberrant behavior. Finally, EE was evaluated using stimuli that were preferred over the challenging response. Alternative treatments were also examined when EE failed to decrease the target behavior. During EE sessions, preferred items were available noncontingently, but no social interaction was provided. The results showed that free-operant preference assessment correctly predicted the success or failure of EE to decrease challenging behavior, and helped to identify the possible treatment alternatives when EE was not effective.
The similarity between NCR and EE is that they both attempt to provide noncontingent access to matched or preferred items. However, when a functional analysis and a preference assessment fail to develop an effective treatment, researchers might tend to arbitrarily select stimuli (LeBlanc et al., 2000). Instead of attempting to identify environmental stimuli, several studies have examined the effects of using satiation and deprivation of automatically maintained behavior on that behavior. It has been found that providing a certain period of the time for individuals to engage in automatically maintained behavior, restricting the behavior, or interacting with them may influence the later occurrence of that behavior (e.g., Rapp, 2004, 2006, 2007). Several studies have found that automatically maintained behavior increased following prior restriction of that behavior (Rollings & Baumeister, 1981; Rapp, Vollmer, Dozier, St. Peter, & Cotnoit, 2004; Rapp, 2006). For example, Rapp (2006) examined, in part, the effects of 15 min response blocking on repetitive object tapping in a 9-year-old boy with autism and mental retardation and found that response blocking functioned as an EO for the object tapping. In another study, Rapp (2004) examined the effects of 30 min pre-session access to stereotypic object twirling on the engagement in that behavior in a boy with Downs syndrome by comparing pre-session versus test conditions. During the pre-session condition, the participant was alone in a room with objects he generally twirled for 30 min. After pre-session access, the test condition, was identical to the pre-session condition, was conducted 3 hours later. The results indicated that prior access to stereotypy functioned as an AO for the subsequent engagement in the behavior. Collectively, these studies demonstrate that the deprivation and satiation conditions of
automatically maintained stereotypy can function as EOs and AOs for stereotypic behavior.

It is common that a motivating operation influences the value of reinforcers or punishers directly related to that operation (e.g., food deprivation increases the value of food as a reinforcer). In an extended analysis, Rapp (2007) evaluated the effects of preferred stimulation on vocal stereotypy in one participant with autism and mental retardation. Verbal reprimands were evaluated because the participant’s mother reported that she often used them to interrupt the vocal stereotypy. The stereotypy was measured during three successive components within a reversal design. The three successive components (i.e., pre-intervention, intervention, and post-intervention) were used to evaluate the participant’s stereotypy prior to, during, and after the reprimand intervention condition. During the first and third components, the researchers simply collected data on the occurrences of stereotypy. During the second component (i.e., intervention), brief verbal reprimands were delivered contingent upon each instance of vocal stereotypy. The results showed that vocal stereotypy increased following those reprimands. In other words, reprimands functioned as an EO for vocal stereotypy. The findings extended research by demonstrating that the antecedent social conditions might affect the later engagement in automatically maintained behavior. Additionally, the findings implied that a given establishing operation (i.e., social reprimands) influenced the value of reinforcers (i.e., non-social behavior) that was not directly linked to that operation.

In reviewing previous studies examining the effects of MO manipulations on automatically maintained behavior, it is clear that extended analyses are still needed for
several reasons. First, that there are only a handful of studies that have examined the effects of manipulating MOs on automatically maintained challenging behavior. Second, it is not clear whether all stereotypy in the previous studies was automatically maintained, because this was not confirmed through a functional analysis. Third, the time between pre-session condition and test condition was arbitrarily selected (e.g., Rapp, 2004). Although it is important to identify the environmental events that immediately prior to as well as those events that temporally remote from automatically maintained behavior (Horner et al., 1997), previous studies were limited to examining the effects of temporally distant AOs (i.e., pre-access to stereotypy) on automatically maintained behavior several hours after pre-session exposure. Another feature of an MO is that one or more MOs may affect many behaviors. The results of previous studies suggested that the same MO (e.g., social interaction) effects not only attention maintained behavior (e.g., McComas et. al., 2003), but also stereotypic behavior (e.g., Rapp, 2007) that was presumed to be automatically maintained. No studies were identified that have investigated the effects of more than one MO on automatically maintained challenging behavior. Given that combined antecedent events are more analogous to the MOs in the natural environment that increase challenging behavior (Call, Wacker, Ringdahl, & Boelter, 2005), it would be meaningful to analyze the effects of non-social events (i.e., deprivation or satiation), social events (especially attention), and combined events on automatically maintained behaviors. Finally, the duration of pre-session conditions appears to have been arbitrarily selected in previous studies. Therefore, the amount of pre-session access needed to affect
subsequent automatically maintained behavior is still unknown (e.g., McComas, et al., 2003; Rapp & Vollmer, 2005).

Compared to behaviors maintained by social consequences, automatically maintained behavior is a “complexly determined behavior” that warrants further investigations (Roantree & Kennedy, 2006, p.383). Taking into account the effects of MOs can facilitate the analysis and development of more effective interventions for automatically maintained behavior. Few studies have (a) simultaneously examined the separate and combined effects of social and non-social antecedent events on automatically maintained behavior, and (b) evaluated the effects of various durations, an important dimension of pre-session conditions, on automatically maintained behavior. The purposes of this study, therefore, are to investigate the extent to which manipulating pre-access to non-social or/and social reinforcement contributes to the elimination of automatically maintained behavior, and the extent to which manipulating the duration of the most effective pre-access condition contributes to the subsequent occurrence of the behavior. Specifically this study examined the following research questions:

1. What are the effects of pre-session exposure to the automatically maintained challenging behavior on the frequency of behavior across four individuals with developmental disabilities?

2. What are the effects of pre-session exposure to social attention on the frequency of automatically maintained behavior across four individuals with developmental disabilities?
3. What are the effects of pre-session exposure to response blocking on automatically maintained challenging behavior across four individuals with developmental disabilities?

4. What are the effects of pre-session exposure to attention plus response blocking on automatically maintained challenging behavior across four individuals with developmental disabilities?

5. To what extent will previously decreased challenging behavior be maintained while the length (i.e., 10 and 5 minutes) of pre-session events is manipulated across four individuals with developmental disabilities?
CHAPTER 2

LITERATURE REVIEW

This chapter presents and discusses the conceptual literature related to motivating operations (MOs), studies examining the effects of MO manipulations, limitations of previous studies, and the purposes of the current study.

Motivating Operations

The current section provides an overview of general concepts and important features of MOs. This includes the definition of MOs, types of MOs, two basic effects of MOs, the momentary influence of MO, and multiple effects of MOs.

Definition of Motivating Operation

Before Laraway et al. (2003) suggested using the term motivating operations to replace establishing operations (EO), Michael (1993) defined an EO as “an environmental event, operation, or stimulus condition that affects an organism by momentarily altering (a) the reinforcing effectiveness of other events and (b) the frequency of occurrence of that part of the organism’s repertoire relevant to those events and consequences” (p. 192). According to Michael (1982, 1993, 2000), the two effects
(or functions) of an EO are: the reinforcer-establishing effect and the evocative effect. When an EO momentarily alters the effectiveness of certain other events as reinforcer or punishers, the influence is termed the reinforcer-establishing effect. When an organism’s repertoires associated with those reinforcing or punishing events are also momentarily altered by the EO, the influence refers to the evocative effect. For example, when an organism is deprived of water (EO) after a lengthy workout, water temporarily becomes a very potent reinforcer (the reinforcer-establishing effect). The organism may also be observed to have a temporary increase in the frequency of behavior associated with getting water to drink, such as rushing around several different places to find a water fountain or pressing the button of a water fountain repeatedly (the evocative effect).

To facilitate applied behavior analysts’ understanding, prediction, and control of behavior, Laraway and colleagues (2003) reformulated the concepts regarding EOs using three modified terms: motivating operation, value-altering effect, and behavior-altering effect. They suggested using the term motivating operation to include both the increase (i.e., EO) and decrease (i.e., abolishing operation, or AO) in the effectiveness of a consequence as a reinforcer or punisher. The value-altering effect of an MO consists of EOs making reinforcers or punishers more effective and AOs making reinforcers or punishers less effective. The evocative effect (i.e., an increase in responding) and the abative effect (i.e., a decrease in responding) were categorized as the behavior-altering effect.
Types of MOs

Many MOs are not learned, as in the water deprivation example above. MOs that are not learned are known as unconditioned MOs (UMOs) and include deprivation or satiation with respect to food, water, oxygen, sleep, sex, activity, changes in temperature resulting in becoming too warm or too cold, and painful stimulation. In contrast, a conditioned MO (CMO) acquires its motivating function as a result of a particular learning history (Michael, 2007).

According to Michael (1993, 2007), there are three kinds of CMOs: surrogate, reflexive, and transitive. A surrogate CMO (CMO-S) refers to a previously neutral stimulus that has been paired with a UMO, and has the same effect as the UMO with which it was paired. For example, the sight of snow (i.e., a previously neutral stimulus) in combination with a decrease in temperature (i.e., UMO) may (a) subsequently alter the value of an increase in temperature as a reinforcer, and (b) evoke behaviors, such as putting on a sweater, that have been reinforced by an increase in warmth. The CMO-S gains its status as a CMO when the sight of snow alone leads to the behavior of putting on the sweater, without the change in temperature. Therefore, a CMO-S achieves what the UMO accomplishes, or is a surrogate for the UMO.

When a previously neutral stimulus obtains the motivational effect by preceding some form of worsening or improvement, the stimulus is called a reflexive CMO (CMO-R). A CMO-R increases the value of conditioned negative reinforcement and evokes any behavior that terminates or removes the current aversive condition. For instance, a student may engage in challenging behavior to escape from demands from a teacher,
because the presence of the instructional demands is a warning stimulus that was previously related to high rates of errors (the worsening situation). Thus, a CMO-R makes its own (reflexive) removal more effective as a reinforcer.

The third type of CMO is the transitive CMO (CMO-T), which is used to describe a situation in which a previously neutral stimulus alters the reinforcing (or punishing) effectiveness of another stimulus and evokes (or abates) behavior that has previously led to that stimulus. In an example provided by Tapper (2005), consider a man who is about to make a cake but does not have any sugar, one of the key ingredients listed in the recipe. In this case, the written word, “sugar” (the previously neutral stimulus), is functioning as a CMO-T because the word increases the reinforcing effectiveness of having sugar (another stimulus) which has been correlated with making a cake (reinforcer). In another example provided by Michael (2007), a food-deprived rat presses a level that turns on a tone. In the presence of the tone, the rat engages in other behavior that results in food delivery. In this situation, the food deprivation (CMO-T) makes the tone (another stimulus) effective as a conditioned reinforcer. In this way, a CMO-T makes something else (instead of itself) effective as a reinforcer.

Features of MOs

The Third Effect of an MO

As described earlier, in order for an environmental event, operation, or stimulus condition to function as an MO, it must have two effects: the value-altering and behavior-altering effects. However, the change in the frequency of a behavior (i.e., behavior-altering effect) can actually come from two sources (Laraway et al., 2003; Michael, 2007).
It can either be a direct influence that is produced by the value-altering effect, or it can be an indirect influence that is generated by changing the effectiveness of the relevant discriminative stimuli ($S^D$). This indirect influence can be considered as another (or third) effect of an MO. For example, the effects of pre-session attention on later engagement of attention maintained challenging behavior were evaluated in the presence as well as the absence of a therapist (O'Reilly, Edrisinha, Sigafoos, Lancioni, Machalicek, & Antonucci, 2007b). To examine the indirect effects of the $S^D$ on challenging behavior, an attention-extinction condition was used, during which the therapist (i.e., $S^D$) was present but reinforcement (in the form of attention) was not available. On the other hand, when the direct effects were examined, an alone condition was use as the test condition because the therapist (i.e., $S^D$) and reinforcement were presumably absent.

Given that there are similarities between an MO and $S^D$, it is easy to confuse one with the other. MOs and $S^D$s are both antecedent stimuli that occur before a behavior and alter the frequency of that behavior (i.e., behavior-altering effect). However, they are different in several ways. First, MOs are related to the differential reinforcing effectiveness of a particular type of stimulus condition, while $S^D$s signal the differential availability of a currently effective form of reinforcement. Second, for a variable to qualify as an $S^D$, there must always be a stimulus condition to signal the unavailability of a given reinforcer (S delta); however, this criterion does not exist for an MO (Cooper, Heron, & Heward, 2007; Michael, 2007).
Momentary Effect of an MO

Based on Laraway et al. (2003) definition mentioned earlier, an MO is an environmental event, operation, or stimulus condition that affects an organism via two momentary effects (value-altering and behavior-altering effects). The statement indicates that the effects of an MO are temporary. Once the MO is reduced or removed, the value of a given consequence may re-establish, and the changed frequency of behavior that has led to that consequence may also return. For instance, sleep deprivation (an EO) increases the effectiveness of sleep as a reinforcer, and increases the current frequency of behavior that has been reinforced by that consequence in the past. When the EO is eliminated, sleep may not be as valuable as it was at a given moment, and the frequency of relevant behavior (e.g., finding a quite place to sleep) may also decrease.

Several previous studies have evaluated the momentary effects of MOs. For example, Lindberg, Iwata, Roscoe, Worsdell, and Hanley (2003) conducted two experiments to investigate the short-term versus long-term therapeutic effects of noncontingent reinforcement (NCR) in 5 individuals with mental retardation. The first experiment, which included three phases, examined the effects of NCR on 2 participants’ arbitrary responses. During baseline, a low-preference (LP) leisure item was provided and high levels of engagement with that item were observed for both participants. When high-preference (HP) and LP items were available during 10 min brief sessions in the second phase, both participants’ manipulation of the LP item quickly decreased and was replaced by engagement with the HP item. In the third phase, the same HP and LP items were provided over extended durations of 120 min (NCR constant). The data showed that
one participant continuously manipulated the HP item and never engaged with the LP item. However, the other participant’s manipulation of the HP item decreased toward the end of the NCR-constant sessions, and the manipulation of the LP item increased. In Experiment 2, NCR was used to treat automatically maintained SIB in 3 participants. They found that the brief sessions of NCR decreased SIB for all 3 participants. However, the therapeutic effects of NCR in extended sessions were observed for only 1 participant. For the other 2 participants, their manipulation of the preferred items decreased and SIB increased during extended sessions. In this experiment, it appeared that NCR functioned as an AO for SIB for the 3 participants during brief sessions, but the effects did not maintain for 2 of the 3 participants during extended sessions. This example suggests that once the EO for challenging behavior returns, the frequency of challenging behavior may return.

The momentary effects of MOs were also evaluated in Roantree and Kennedy (2006), in which the authors noted that although pre-session attention has been observed to function as an AO for behavior maintained by social positive reinforcement, at least one behavioral approach (i.e., priming) suggested that pre-session attention could function as an EO. To test this, they analyzed the effects of noncontingent positive comments on stereotypy in a child with severe mental retardation. Although the results of the initial functional analysis demonstrated inconclusive outcomes (i.e., undifferentiated results), informants reported that the participant responded to attention. Therefore, it was hypothesized that social attention could be a positive reinforcer for stereotypy. In the subsequent phase, 20 min of pre-session noncontingent attention was provided
immediately before functional analysis sessions. Following pre-session access, elevated levels of stereotypy were observed during the attention condition, suggesting that attention functioned as an EO for stereotypy. Finally, a return to the initial procedure (no pre-session condition) again resulted in an inconclusive outcome. The findings suggested that when the EO was removed, the sensitivity to attention as a positive reinforcer was eliminated.

MOs Affect Multiple Behaviors

Studies have demonstrated that one or more MOs can have multiple (and sometimes simultaneous) effects on various behaviors (e.g., Bruzek & Thompson, 2007; Call et al., 2005; Derby, Fisher, & Piazza, 1996; Goh et al., 2000; Horner et al., 1997; Laraway et al., 2003; Northup, Fusilier, Swanson, Roane, & Borrero, 1997; Poling, 2001). For example, Horner and colleagues (1997) examined the effects of neutralizing routines (MO) on aggression and/or SIB in 3 individuals with developmental disabilities. Following the initial functional analyses suggesting that the challenging behaviors were maintained by escape for 2 participants and by access to edible items for the other participant, an alternating treatment design was used to examine challenging behavior during instruction under four conditions (i.e., $S^D$ only, EO only, EO plus $S^D$, and neither $S^D$ nor EO). The $S^D$s for problem behaviors involved error corrections for 2 participants. For the remaining participant the $S^D$s was being physically interrupted when he reaching for a food item on the reinforcer tray. Based on the information gathered from interviews with the participants’ staff, potential EOs were identified for each participant. These EOs were (a) a delay of 15 min or more in a planned, preferred activity; (b) postponement of a
planned, preferred activity to the next day; or (c) less than 5 hrs of sleep the previous night. The results showed that all participants engaged in relatively high levels of challenging behavior during the EO plus SD condition.

During a further analysis, they hypothesized that manipulating MOs (i.e., neutralizing routines) prior to presenting the SD could decrease the occurrence of challenging behavior. Short activities that might reduce the value of the EOs were identified based on staff members’ reports. These routines involved a brief period of one-to-one contact with a staff member, and preferred routines for 2 of the 3 participants. The neutralizing routine for the remaining participant was taking a nap. Using an ABAB design, they examined the effects of adding and removing the neutralizing routines on challenging behavior. The results suggested that neutralizing routines (i.e., MO manipulations) functioned as an AO for challenging behavior and an EO for staff praise in all participants. The findings showed that neutralizing routines (MOs) might have multiple effects on challenging behavior maintained by different consequences (i.e., tangibly maintained vs. escape maintained).

In another study, Call and colleagues (2005) examined whether combining antecedent variables as MOs within a functional analysis could clarify Type II errors (or false-negatives). A type II error is observed in a functional analysis when an individual engages in challenging behaviors in the natural environment, but does not demonstrate such behaviors under the functional analysis test conditions (Wacker, Berg, Harding, & Cooper-Brown, 2004). Call et al. hypothesized that Type II errors might occur because a typical functional analysis manipulates only a single antecedent variable and the
corresponding consequence. They suggested that manipulating multiple MOs within functional analyses might occasion challenging behavior for individuals whose functional analysis results reveal false-negative findings. To test their hypothesis, a multi-element design (including single-antecedent and combined-antecedent test conditions) and multiple baseline design across participants were used to investigate the functions of the aggressive behavior of 2 participants. The results demonstrated that one participant’s aggression was often observed during the combined demand and restricted tangible items condition, while the other participant engaged in relatively high levels of aggression during the combined demand and diverted attention condition. The findings supported that more than one MO may have be manipulated to further analyze their complex effects on challenging behavior.

In addition to the aforementioned studies, Northup et al. (1997) examined whether the administration of methylphenidate (MPH) would alter the value of various stimuli often used in classroom-based behavioral treatment programs (e.g., activities, tangible items) in 3 participants with attention deficit hyperactivity disorder. Thirty six common classroom rewards were identified and divided into seven categories. Seven colored token coupons were made to represent each category of potential reinforcers. Contingent on completed math problems, all seven coupons were provided for choices. After the participants learned how to obtain coupons and exchange them for reinforcers, reinforcer assessments were repeated in a reversal design. The participant received either placebo or the previously prescribed dosage of MPH. All assessment procedures were conducted within 1 to 3 hr after oral administration. The results suggested that MPH decreased the
reinforcer effectiveness of token coupons exchangeable for edible items (i.e., functioned as an AO) and increased the reinforcer effectiveness of the token coupons exchangeable for activities (i.e., functioned as an EO). These findings indicated that an MO can simultaneously and differentially influence the values of different reinforcers.

In an attempt to examine the effects of one MO on different behaviors, Derby et al. (1996) examined whether a given stimulus condition could simultaneously affect different behaviors maintained by the same contingency. In their study, SIB and self-restraint displayed by a participant with mental retardation were assumed to be within the same functional response class. The results of a functional analysis showed that SIB was sensitive to social attention. Using noncontingent attention, they found that the attention could function as an AO for not only SIB but also self-restraint. More recently, Bruzek and Tompson (2007) found that observing peers playing functioned as an EO for manipulating low preference items and as an AO for engagement with high preference items. These results indicated that different behaviors that were simultaneously influenced by a given MO could be functionally equivalent or under the same response class. The findings were also supported by Goh et al. (2000) who found that pre-session attention manipulation can influence attention maintained challenging behavior versus appropriate manding responses.
Overview of Applied Studies Examining MOs

Conceptual discussions of MOs have enabled researchers to properly identify and empirically investigate motivational variables that might alter the frequency of challenging behavior. In recent years, there have been an increasing number of theoretical and practical advances in terms of contriving MOs to eliminate socially maintained challenging behaviors. The following section will discuss applied studies examining MOs on challenging behavior maintained by social positive reinforcement, social negative reinforcement (especially, escape from instructional demands), and automatic reinforcement.

Studies Regarding Socially Maintained Challenging Behavior

Behavior Maintained by Social Positive Reinforcement

MO interventions for challenging behavior maintained by positive reinforcement (e.g., attention or tangible items) involve reducing the effect of the maintaining reinforcer. Providing pre-session noncontingent access to the reinforcer could attenuate the related deprivation condition, which in turn could decrease challenging behaviors (McGill, 1999; Wilder & Carr, 1998).

For example, DeLeon and colleagues (2005) examined the effects of attention on pseudo-seizures in an individual with severe mental retardation and a severe idiopathic seizure disorder. The effects of noncontingent attention were evaluated using a reversal design in which baseline and continuous positive attention conditions were alternated across phases. The results suggested that positive attention functioned as an AO for
“pseudo-seizures”. The findings also extended the use of noncontingent reinforcement to a novel behavior (i.e., seizure).

More recently, Carlson and colleagues (2008) examined the effects of choice-making as an AO for public disrobing and urinary incontinence maintained by social positive reinforcement in two children with developmental disabilities. Based on the data from functional assessments and interviews with staff members, it was hypothesized that the participants’ challenging behaviors were maintained by tangible items (i.e., preferred clothing). An AB design combined with a multiple baseline across participants design was used in the study. In the baseline condition, any attempt at disrobing resulted in disapproval from staff members. Successful disrobing resulted in re-dressing in the same article of clothing. If the participant urinated on his clothes, clean and dry clothes were provided. During intervention, two choices of preferred articles of clothing were presented for each choice opportunity in a day. Participants were allowed to change into an article of clothing they selected in a nearby bathroom following the offered opportunity. No consequences were provided for declining the opportunity. Any challenging behavior resulted in the same consequences used in baseline. Public disrobing and urinary incontinence decreased for both participants following the provision of choice, suggesting that providing those choices seemed to serve as an AO for challenging behavior.

One line of research with respect to challenging behaviors maintained by social positive reinforcement is to examine the isolation of the behavior-altering effect of an MO in the context of different types of subsequent conditions. This is generally done by
manipulating pre-session conditions and measuring the effects on the behavior in subsequent sessions. Following the pre-session condition, many subsequent test conditions have been evaluated in the literature: contingent-challenging behavior conditions, challenging behavior-extinction conditions, alone conditions, instructional conditions, and/or leisure conditions.

During the contingent-challenging-behavior condition (i.e., FR 1 condition), a reinforcer was provided contingent on each occurrence of challenging behavior on a fixed-ratio or FR 1 schedule to test the value-altering effects of MOs. For instance, O’Reilly et al. (2006a) manipulated pre-session access versus no access to attention prior to an attention condition during a functional analysis. They found that restriction of pre-session attention increased the value of attention as a reinforcer during the subsequent test condition (i.e., contingent-challenging-behavior condition).

During the challenging-behavior-extinction condition (i.e., extinction condition), discriminative stimuli were visible but unavailable and challenging behavior was placed on extinction to test the behavior-altering effect of an MO. For example, the effects of pre-session access versus no access to snacks on challenging behavior were evaluated in a subsequent test condition (O’Reilly et al., 2006b). During the test condition, the snacks were visible but unavailable and no consequences were provided for challenging behavior. The results showed that when pre-session access to snacks was restricted, the frequency of the challenging behavior increased.

The alone condition involving the concurrent absence of the S^D and the consequence was used to test one mechanism of the behavior-altering effect of an MO.
O’Reilly and colleagues (2007b) found that when pre-session attention was not provided, the frequency of attention maintained behavior could increase in the absence of both $S^D$ (i.e., the researcher’s presence) and the contingent reinforcement.

Finally, the instructional and leisure conditions were used to answer particular research questions. For instance, studies have manipulated the behavior-altering effects of MOs to decrease subsequent challenging behavior during classroom instruction (e.g., O’Reilly et al., 2007a) and leisure activities (O’Reilly et al., 2008) because high levels of these undesired challenging behavior were observed during those particular natural settings.

It was noted that for each of the prior studies conducted by O’Reilly and colleagues (2006a, 2006b), a three-phase procedure was used: (1) Phase 1 was a consequence-based analogue functional analysis, (2) Phase 2 was no access vs. continuous access to reinforcers that had been identified in Phase 1 followed by the contingent-challenging behavior conditions and (3) Phase 3 was identical to Phase 2 except that challenging behavior in this phase was placed on extinction (challenging behavior-extinction condition/extinction condition). Therefore, Phase 1 was conducted to analyze the functions of challenging behavior. Antecedent manipulations with contingent consequences were used to assess the value-altering effects of MOs in Phase 2. Finally, without any programmed consequences, the behavior-altering effect of an MO was evaluated during Phase 3. The results generated in Phases 2 and 3 in each study published before 2007 were similar. That is, the antecedent manipulations were found to function as
an MO (value-altering) in Phase 2, and the behavior-altering effect of an MO was demonstrated in Phase 3.

Extending the previous studies and testing two hypotheses regarding mechanisms involved in the behavior-altering effect of an MO as suggested by Michael (1982, 1993), O’Reilly et al. (2007b) conducted another study. They examined the effects of pre-session attention on challenging behavior during subsequent attention-extinction and alone conditions in an individual with a severe disability and challenging behavior. To further test two hypotheses regarding mechanisms involved in the behavior-altering effect of MOs as suggested by Michael (1982, 1993), O’Reilly et al. (2007b) began by describing these two mechanisms. Recall the aforementioned third effect of an MO; MOs may not only have a direct effect on behavior itself, but also an indirect effect on SDs for behavior that has been followed by that class of reinforcers. In the case of the direct effect, an alone condition was used as a test condition during which the SD and reinforcement (attention) were absent. In terms of the effect of the SD, the presence of a person (SD) signaled the presence but unavailability of reinforcement. A within-subject multi-element design was used to compare four test conditions: pre-alone followed by an alone condition, pre-attention followed by an alone condition, pre-alone followed by an attention-extinction condition, and pre-attention followed by an attention-extinction condition. The pre-alone condition was 15 min alone in treatment room; the pre-attention was 15 min with continuous attention provided on a FT 10 s schedule; the alone condition was 5 min alone in the same room; and the attention-extinction condition was 5
min with the presence of a therapist sitting in the room with the participant without any interaction.

The results suggested that the two mechanisms accounted for the behavior-altering effect of an MO. During the attention-extinction condition, increasing levels of challenging behavior followed by pre-attention suggested that the MO had an effect on the $S^D$ while the reinforcing consequences (attention) were absent. In other words, this finding demonstrated one mechanism of the behavior-altering effect of an MO and replicated O’Reilly and colleagues’ (2006a) study. Another finding of this study extended previous results by demonstrating that the relevant behavior-altering effect can occur in the absence of both the $S^D$ and the relevant consequences. These results contradicted several findings in the literature (e.g., Horner et al., 1997). However, the authors stated that they were unable to address the conflicts because of several differences between their research and prior studies. For instance, the behaviors targeted were maintained by different consequences. In addition, the test conditions were quite different in terms of the types of deprivation and reinforcement procedures. O’Reilly et al. (2007b) therefore suggested the need to further examine the functional properties of MOs to improve the assessment methods for challenging behavior.

According to the findings from previous studies, researchers have successfully conducted experimental procedures of MO manipulations to decrease challenging behavior maintained by social positive reinforcement.
Behavior Maintained by Escape from Instructional Demands

Following a functional analysis indicating that challenging behavior is maintained by escape, additional analyses are required to further specify the stimuli that establish escape as a negative reinforcer (Crockett & Hangopian, 2006; Ebanks & Fisher, 2003). Previous studies have demonstrated that a variety of stimuli can establish escape from instructional demands as a negative reinforcer. These stimuli have included frequency of demands, task difficulty, task materials, prompting procedures, and the pace of task presentation. Manipulating these stimuli may be one approach to the treatment of behavior maintained by social negative reinforcement (Carbone et al., 2007).

Crockett and Hagopian (2006) evaluated the effects of altering the EO for escape maintained challenging behavior in a 19-year-old male diagnosed with Nager’s syndrome, mild mental retardation, and deafness by withholding gestural and physical prompts. Based on the results of the functional analysis, functional communication training (FCT) with—and then without—escape-extinction were implemented to teach the participant to request breaks. However, attempts to constrain the frequency of breaks resulted in increased challenging behavior. In addition, during the escape period, it was found that the participant often independently completed the task. The researchers, therefore, hypothesized that other factors evoked challenging behavior.

To test this hypothesis, the researchers compared two prompting procedures using an AB design and a multiple baseline across tasks design. The tasks were divided into three subcategories based on different task difficulties. A three-step prompting procedure
(i.e., Phase A) was compared with a modified prompting procedure (i.e., Phase B). The three-step prompting procedure that was commonly used to deliver demands included sequential verbal, gestural, and physical prompts. The modified prompting procedure involved delivering only one verbal prompt to start working. The consequences were brief verbal praise for working and assistance for requesting help. Requesting breaks and challenging behavior were placed on extinction. The modified prompting procedure led to decreases in challenging behavior and break requesting and an increase in compliance and task completion compared to the three-step prompting procedure. The results indicated that the three-step prompting procedure functioned as an EO for challenging behavior across task sets and that manipulating the EO using the modified prompting procedure resulted in a decrease in escape maintained challenging behavior and a sustained increase in compliance and task completion.

In addition to modifying prompting procedures, prior or interspersed events have also been used to eliminate challenging behavior maintained by negative reinforcement (Carr, Newsom, & Binkoff, 1976; McGill, 1999). For example, Ebanks and Fisher (2003) examined the effects of altering the timing of academic prompts and interspersing easy tasks on treating escape maintained destructive behavior in a 19-year-old man with mental retardation and developmental disabilities. Functional analysis results indicated difficult demands and immediate corrective feedback regarding the participant’s errors resulted in high levels of destructive behavior. To manipulate the EO for the behavior, the researchers (a) interspersed easy tasks with difficult tasks to reduce overall task difficulty and (b) delivered corrective feedback as an antecedent prompting procedure while re-
presenting a previously failed task. Using an ABAB reversal design, effects of the intervention involving EO manipulations (i.e., Phase B) were compared with the procedures involving difficult demands and consequent feedback (i.e., Phase A). The results demonstrated that the EO manipulations produced zero levels of destructive behavior even when the escape contingency was in place. During the consequence feedback condition, on the other hand, high levels of destructive behavior were observed when corrections immediately followed errors.

McGill (1999) stated that manipulating MOs may also help overcome a limitation of extinction. In the case of escape maintained challenging behavior, escape extinction may work not just because escaping from the aversive stimulation no longer produces reinforcement, but because it also modifies the relevant EO (e.g., frequent contact with difficult demands with practice and support could make the demands become easier to an individual). In Ebanks and Fisher’s (2003) study, however, the findings demonstrated that even though the reinforcement was still in effect, modifying the relevant EOs (i.e., task difficulty and the timing of academic prompts) systematically reduced challenging behavior maintained by negative-reinforcement behavior. Thus, Ebanks and Fisher’s study extended the literature on systematically manipulating the effects of EOs with escape maintained behavior.

To date, studies have examined the effects of functionally related MO manipulations on social maintained challenging behavior. It appeared that, for example, if a given behavior was maintained by attention, it would be influenced by the absence or presence of pre-session attention. Pre-session attention is unlikely to have an effect on
escape maintained behavior. To further analyze whether functionally related versus unrelated MO manipulations have an effect on socially mediated behavior, McComas and colleagues (2003) examined the effects of pre-session attention on challenging behavior maintained by attention, escape, and both in five elementary-school children with developmental and learning disabilities across three experiments. In addition to examining the differential effects of pre-session, they evaluated the effects of pre-session attention conditions of varying duration.

There were three experiments in the study. In experiment 1, functional analyses were conducted to identify the maintaining consequences of the challenging behavior. In experiment 2, the effects of pre-session attention on attention maintained behavior were evaluated. Each 10 min pre-session condition (i.e., continuous attention) was immediately followed a 10 min test condition. For 1 participant, the effects of 5 min continuous pre-session attention on attention maintained behavior during the test conditions were also examined. The test condition in this experiment involved providing attention contingent on that behavior. In the final experiment, they examined the effects of 10 min pre-session attention on escape maintained behavior during 10 min test conditions. During 10 min test conditions, the adult directed the participants to complete independent seatwork; 10 s escape was provided contingent on each occurrence of challenging behavior.

The results of functional analyses suggested that the challenging behaviors were maintained by attention for 2 participants, escape for 2 participants and both attention and escape for the 5th participant. The participant with multiply maintained challenging behavior was included in both the second and the third experiments. The results of the
last two experiments showed that (a) pre-session attention decreased attention or multiply
maintained challenging behavior (i.e., functioned as an AO); (b) 5 min pre-session
attention was as effective as 10 min pre-session attention to reduce attention maintained
challenging behavior for 1 participant; and (c) pre-session attention had no effect on
escape maintained challenging behavior. These findings provided a preliminary analysis
regarding the effects of pre-session attention condition as well as its length on
challenging behavior maintained by attention and/or escape.

Behavior Maintained by Non-social Consequences

To date, interventions investigating MO manipulations have been examined
primarily with individuals who engage in socially maintained challenging behaviors.
Relatively little attention has been given to automatically maintained challenging
behavior. However, several studies (e.g., Rapp, 2004, 2006, 2007; Van Camp et al.,
2000) have found that some types of automatically maintained behavior may be sensitive
to MO manipulations. For example, Van Camp and colleagues (2000) examined the
effects of identifying idiosyncratic stimuli on challenging behavior in 2 boys, one with
moderate mental retardation and one with no developmental delays. After
undifferentiated results were observed during typical functional analysis sessions, further
evaluation was conducted and indicated that specific antecedent events (i.e., social
interaction, a specific toy) might serve as EOs for the participants’ challenging behavior
that persisted in the absence of social contingencies.

Other studies have found that automatically maintained behavior has decreased
following pre-session access to that behavior, and increased following prior restriction of
that behavior (Rollings & Baumeister, 1981; Rapp et al., 2004; Rapp, 2004, 2006). For instance, Rapp (2004) examined the effects of 30 min pre-session access to stereotypic object twirling on the later occurrence of that behavior in a boy with Downs syndrome. The levels of stereotypic object twirling were compared during two daily sessions using a multi-element design. The first daily session (i.e., pre-session access to stereotypy) was conducted early in the day, and the participant was alone in a room with cords and shirts for 30 min. The second daily session was identical to the first daily session except that it was conducted 3 h later. The results indicated that prior access to stereotypic behavior during the first daily session produced lower level of that behavior during the second session of the day. That is, prior access to stereotypy served as an AO for later object twirling.

In another study, Rapp (2006) examined the effects of 15 min noncontingent matched stimulus (NMS) and response blocking on repetitive object tapping (stereotypy) in a 9-year-old boy with autism and mental retardation. A multiple schedule (i.e., a 45 min session) that included three 15 min components (i.e., pre-intervention, intervention, and post-intervention) was used in his study. The NMS analysis was first examined during 45 min sessions. Subsequently, a control condition (i.e., two 15 min pre-intervention followed by 15 min NMS) was conducted to evaluate the levels of object tapping during the reversed condition. The response blocking analysis was finally conducted using the same procedure as the NMS analysis. During the pre-intervention component, the participant was seated at a table and no social consequences were provided for his behavior. During the NMS intervention component, preferred items (i.e.,
toys) were provided noncontingently. During the response blocking intervention component, no toys were provided and any attempts of object tapping resulted in response blocking (i.e., placing the participant’s hand back to his lap). The post-intervention component was identical to the pre-intervention component except that it was conducted after intervention. The results showed that the pre-intervention NMS component produced a lower level of stereotypy than the pre-intervention component. This suggested that pre-session access to stereotypy function as an AO for that behavior. However, when the intervention was response blocking, the component that followed intervention (no alternative and presumably unmatched stimulation) always contained higher levels of stereotypy than the pre-intervention component, suggesting that response blocking functioned as an EO for object tapping.

Collectively, Rapp’s studies (2004, 2006) demonstrated that the deprivation and satiation conditions of automatically maintained stereotypy functioned as an EO and AO for that behavior, respectively. Those findings were consistent with previous studies (i.e., Ebanks & Fisher, 2003; McComas et al., 2003; O’Reilly, 2007a) by demonstrating that a motivating operation can influence the value of reinforcers or punishers that directly relate to that operation. For example, attention deprivation functioned as an EO for attention maintained behavior, while food satiation acted as an AO for behavior maintained by food.

However, some idiosyncratic variables have been found to influence socially mediated challenging behavior (e.g., Fisher, Adelinis, Thompson, Worsdell, & Zarcone, 1998; Iwata et al., 1994; Wacker et al., 1996). In one study, Wacker and colleagues
examined the effects of meal schedule and quantity on challenging behavior in 2 young children with severe developmental disabilities and feeding problems who engaged in SIB. They found that attention was established as a reinforcer for attention maintained SIB only under the condition of food satiation. Iwata and colleagues found that certain ambient noises (e.g., music, the phone ringing) or social interaction functioned as an EO for escape maintained SIB.

Similarly, studies have found that social interaction might have an effect on automatically maintained behavior. For example, Rapp (2007) evaluated the effects of preferred stimulation on vocal stereotypy in 2 participants with autism and mental retardation. Two experiments were conducted in this study. The first experiment examined whether vocal stereotypy persisted in the absence of social consequence, to identify preferred alternative stimuli, and to analyze whether providing preferred stimuli noncontingently would decrease stereotypy. The results showed that for both participants, high levels of vocal stereotypy were observed in the nointeraction condition, suggesting that stereotypy was, at least partly, maintained by automatic reinforcement. In addition, auditory stimuli were identified for the participants to decrease vocal stereotypy; however, for one participant vocal stereotypy increased when preferred item were added to music. Collectively, these findings indicate that auditory simulation competed with or substituted for the sensory consequence that maintained the vocal stereotypy.

During the MO assessment, stereotypy was measured during three successive components within a reversal design (i.e., a combination reversal plus multiple schedule design). The three successive components were pre-intervention, intervention, and post-
intervention. Each component was 15 min in length for one participant and 10 min for the other. The purposes of this experiment were to evaluate (a) the effects of pre-session access to sound-producing toys (i.e., letter board and toy workbench) on 1 participant’s vocal stereotypy and (b) the effects of pre-session access to music from a CD player, gum, and contingent verbal reprimands on the other participant’s vocal stereotypy. Chewing gum was evaluated because the participant always asked for it and it seemed to be a highly preferred item. The verbal reprimands were evaluated because the participant’s mother reported that she often used them to interrupt the vocal stereotypy.

The results of this analysis suggested that (a) after the auditory stimuli were removed, vocal stereotypy remained below pre-intervention levels for both participants and that (b) vocal stereotypy increased during post-intervention following the removal of contingent reprimands. Therefore, pre-session access to auditory stimuli may function as an AO and contingent reprimands may act as an EO for vocal stereotypy. The finding that reprimands might impose deprivation for the stimulation produced by vocal stereotypy extended research by demonstrating that the antecedent social conditions affected the later engagement in automatically maintained behavior. Additionally, this finding implied that a given establishing operation (i.e., social reprimands) influenced the value of reinforcers (i.e., non-social behavior) that was not directly linked to that operation.

Implications and Conclusions

In reviewing previous studies that have examined the effects of MO manipulations on automatically maintained behavior, it is clear that extended analyses are still needed for several reasons. First, no experimental procedure was provided as to
whether the stereotypy in the previous studies (e.g., Rapp, 2004, 2006, 2007) was automatically maintained, because no functional analyses were conducted. Second, it is important to examine the effects of environmental manipulations that immediately precede a session as well as those events that are temporally remote from automatically maintained behavior (Horner et al., 1997). However, previous studies (e.g., Rapp, 2004) have only examined the effects of temporally distant AOs on automatically maintained behavior (i.e., pre-access to stereotypy was 3 hrs before the test condition). One feature of an MO is that one or more MOs may affect many behaviors. The results of previous studies suggested that the same MO (e.g., social interaction) affected not only attention maintained behavior (e.g., McComas et. al., 2003) but also stereotypic behavior (e.g., Rapp, 2007) that was often assumed to be automatically maintained. No studies were identified that have investigated the effects of more than one MO on automatically maintained challenging behavior. Given that combined antecedent events were more analogous to the MOs in the natural environment that increased challenging behavior (Call et al., 2005), it might be meaningful to analyze the effects of non-social events (i.e., deprivation or satiation), social events (especially attention), and combined events on automatically maintained behaviors. Finally, the duration of pre-session conditions appears to have been arbitrarily selected in previous studies. Therefore, the amount of pre-session access needed to affect subsequent automatically maintained behavior remains to be known (e.g., McComas, et al., 2003; Rapp & Vollmer, 2005).

Compared to behaviors maintained by social consequences, automatically maintained behavior is a complexly determined behavior that warrants further
investigations (Roantree & Kennedy, 2006). Taking into account the effects of MOs can facilitate the analyses and development of more effective interventions. Few studies have (a) simultaneously examined the separate and combined effects of social and non-social antecedent events on automatically maintained behavior, and (b) evaluated the effects of various durations, an important dimension of pre-session conditions, on automatically maintained behavior. The purposes of this study, therefore, were to investigate the extent to which manipulating pre-session access to non-social or/social reinforcement contributes to the elimination of automatically maintained behavior and the extent to which manipulating the duration of the most effective pre-session access condition contributes to the occurrence of the behavior.
CHAPTER 3

METHOD

In this chapter, the methods used in this study are presented. The first section includes a description of participants and settings. Next, the measurement system used and target responses are defined. The data collection techniques and inter-observer reliability method are described in the third section. Subsequently, the experimental designs and procedures are detailed. Finally, the procedures used to obtain procedural integrity and social validity data are discussed.

Participants and Settings

Participants

Four students between the ages of 11 and 18 with multiple disabilities and moderate to significant intellectual cognitive impairments participated in this study. All participants attended a self-contained school designed for individuals with mental retardation and developmental disabilities. The participants were selected for inclusion if (a) their challenging behavior was maintained by non-social consequences based on
functional analysis results, and (b) their parents and guardians consented to their participation (See Appendix A for endorsement and consent letters).

Rosy was an 11-year-old female with diagnoses of Down syndrome and Pervasive Developmental Disorder—not otherwise specified (PDD-NOS). Rosy was ambulatory but had an awkward gait. She was nonverbal but made occasional noises to indicate emotions.

Alex was a 14-year-old male diagnosed with Spinal bifida, hydrocephalus with shunting and a seizure disorder. He was non-ambulatory and only pushed his wheelchair with his left hand for short distances. Alex communicated primarily in the form of informal sounds and gestures.

Jane was a 16-year-old female who was diagnosed with severe mental retardation. She had an unsteady gait—she would cross her feet over in front of each other, causing her to lean from side to side when walking. Jane was nonverbal but made occasional noises to express emotions.

Cheri was an 18-year-old female who had the following diagnoses: cerebral palsy, scoliosis, seizure disorder, and profound mental retardation. Cheri did not ambulate independently and was transported with a wheelchair. She vocalized primarily through cries and used no words. She indicated discomfort through her cries and indicated pleasure through increase vocalizations and body movement.

**Settings**

Sessions were conducted in a small room not being used for instruction or in an unoccupied portion of a classroom. The rooms in which the experimental sessions were conducted contained a table, chairs, and study materials. Sessions were conducted
approximately 3 to 5 days per week. Depending upon the student availability and session tolerance, multiple sessions were conducted per day. Materials included preferred items and academic tasks that were identified by each participant’s teacher. The preferred items were toy drums and toy piano for Rosy. Three musical instruments and a chewy were used for Jane. A toy mouse, a cotton string, and a toy musical hanger were provided for Alex. Finally, items identified for Cheri were a ball, a mirror, and scarfs. Tasks were sorting toy bears and matching letters for Rosy. For Jane, the task material was a drinking cup. A switch and a putting task were used for Alex. For Cheri, the tasks were a switch and blocks.

Dependent Measures, Data Collection, and Inter-Observer Agreement

Automatically maintained behavior was the dependent variable in this study and will be described individually for each participant. The duration was scored in real time and converted to a percentage of the time by dividing the number of seconds engaged in the target behavior by the total number of seconds in the session and then multiplying by 100%. Using prepared data sheets (Appendix B), the target behavior was measured in the functional analysis (Phase 1), the pre-session analysis (Phase 2), and the extended pre-session analysis (Phase 3).

Rosy’s target behavior was mouth tapping, which was defined as contact of either hand to her mouth with repetitive movement. String play for Alex was defined as manipulating or stretching a string (e.g., twisting a string, winding it around his fingers or hands, or stretching it with both hands). For Jane, hand or object mouthing was defined as the insertion of any part of her hand or an object past the plane of the lips or the
protrusion of the tongue out of the mouth onto her hand or the object. Cheri exhibited
two types of behavior: shirt playing and hand viewing. Shirt playing was defined as
grasping and twisting the front of her shirt with simultaneous movement. Hand viewing
was defined as visual orientation toward her hand while moving her hand from side to
side.

All sessions were videotaped and scored at a later time to record the presence of
the target behavior. Two observers, the author and another person, independently scored
data on the target behaviors from the videotapes for at least 30% of all sessions to
determine inter-observer agreement (IOA). The author, who was the primary observer,
taught a second observer the operational definitions of the target behaviors and gave
examples for each. Prior to IOA data collection, the second observer was trained on the
dependent measures to a criterion of at least 80% accuracy across two sessions. The mean
IOA score on the dependent measures was calculated by dividing the shorter of the
two durations recorded by the observers by the longer durations and multiplying by
100 % (Cooper et al., 2007). The overall percent of sessions coded and individual
reliability scores are presented for each participant in Table 3.1.

\[
\text{Inter-observer Agreement} = \frac{\text{Shorter duration}}{\text{Longer duration}} \times 100
\]
Table 3.1: Inter-observer agreement for Rosy, Alex, Jane, and Cheri across all phases, including the total percent of sessions coded per participant.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Rosy (%)</th>
<th>Alex (%)</th>
<th>Jane (%)</th>
<th>Cheri (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Analysis</td>
<td>99.9%</td>
<td>95.4%</td>
<td>99.7%</td>
<td>97.2%</td>
</tr>
<tr>
<td></td>
<td>(R*=99-100%)</td>
<td>(R=82.7-100%)</td>
<td>(R=96.1-100%)</td>
<td>(R=87.9-100%)</td>
</tr>
<tr>
<td>Pre-session Analysis</td>
<td>98.3%</td>
<td>95.6%</td>
<td>98.5%</td>
<td>93.5%</td>
</tr>
<tr>
<td></td>
<td>(R=95-100%)</td>
<td>(R=95.8-96.4%)</td>
<td>(R=93.9-99.6%)</td>
<td>(R=91.2-97.9%)</td>
</tr>
<tr>
<td>Reversal Probe</td>
<td>99.5%</td>
<td>99.8%</td>
<td>99.7%</td>
<td>99.1%</td>
</tr>
<tr>
<td>Treatment Analysis</td>
<td>99.4%</td>
<td>98.9%</td>
<td>96.7%</td>
<td>90.0%</td>
</tr>
<tr>
<td></td>
<td>(R=93-100%)</td>
<td>(R=92.8-99%)</td>
<td>(R=94.3-100%)</td>
<td>(R=79.6-96.7%)</td>
</tr>
<tr>
<td>Percent of Coded</td>
<td>53.9%</td>
<td>36.8%</td>
<td>43.7%</td>
<td>38.3%</td>
</tr>
<tr>
<td>Reliability</td>
<td>(R=36-100%)</td>
<td>(R=32-100%)</td>
<td>(R=34-100%)</td>
<td>(R=31-100%)</td>
</tr>
</tbody>
</table>

*R refers to range.

**Experimental Design**

There were three phases in the current study. In Phase 1, an analogue functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) with extended alone conditions (Vollmer, Marcus, and Ringdahl, 1995) was conducted with each participant to identify the maintaining variable(s) of the target behavior using a multi-element design. Multi-element designs were also used to examine the effects of pre-session access on automatically maintained behavior in Phase 2 as well as the effects of different periods of pre-session access in Phase 3.
Procedures

Prior to the analogue functional analysis, leisure materials and academic tasks were identified for each participant based on the teachers’ recommendation and the students’ individualized education plan (IEP) goals. However, a chewy was always with Jane, as her mother requested. For Alex, a 40 inch cotton string was provided throughout sessions due to the nature of the target behavior.

Functional Analysis (Phase 1)

An analogue functional analysis was conducted with each participant based on the methods described by Iwata and colleagues (1982/1994). Extended no-interaction sessions were completed to verify the results (Vollmer et al., 1995). Four conditions (i.e., no-interaction, unstructured play, social disapproval, and academic demand) were presented in random order for 5 min in every 20 min session. In all conditions, the participant and researcher were in the same room. During the no-interaction condition, neither interaction nor leisure materials were provided to the participants. However, the chewy was with Jane, and the string was available for Alex. During the unstructured play condition, a variety of leisure materials were present within the participant’s reach, and noncontingent positive attention (i.e., a general praise statement) was provided every 30 s. Any occurrences of challenging behavior were ignored. During the social disapproval condition, each participant was provided with a variety of leisure materials. If challenging behavior was observed, the researcher gently pressed down on the participants’ shoulders and gave disapproving statements (e.g., “Don’t do that.”). Finally, during the academic demand condition, the researcher asked each participant to do an academic task following
a three-prompt, least-to-most, hierarchy (i.e., verbal prompt; verbal prompt and pointing; verbal prompt, pointing, plus manual guidance). Social praise was delivered when the participant followed instructions. If challenging behavior occurred, the task was removed and all interaction was suspended for 30 s.

For all participants, extended no-interaction conditions were conducted to confirm that the behavior was maintained by automatic reinforcement. These conditions were identical to the no-interaction conditions described above. Sessions in this phase were conducted three to nine times based on subject availability, usually one to two days per week, until a stable trend in the data was achieved.

*Pre-session Condition/ Motivating Operation Analysis (Phase 2)*

The purpose of this phase was to examine the effects of four different pre-session conditions on the occurrence of automatically maintained behavior in a subsequent 5 min no-interaction condition. In this phase, four pre-session conditions were evaluated: (a) no interaction, (b) attention, (c) response blocking, and (d) attention plus response blocking. Each condition was presented in random order across a 1 hour and 15 min period of the time. Each pre-session condition was 15 min and was immediately followed by a 5 min session of the no-interaction condition (which was identical to the no-interaction condition in the functional analysis). During the pre-session no-interaction condition, no social consequences were provided and the participant was free to engage in the target behavior. For example, Alex had free access to manipulating (e.g., twisting or stretching) the cotton string and no social consequences were given for that behavior. In the pre-session attention condition, noncontingent positive attention (e.g., “that's a nice shirt" or
"I see you're smiling") was delivered approximately once every 30 s, and no social consequences were provided for target behavior. In the pre-session response blocking condition, no attention was provided, and the researcher blocked all attempts of the target behavior by gently redirecting the participant’s hands back to his or her lap prior to completion of the target behavior. For example when Jane moved her hand or object toward her mouth, the experimenter would place her hand between Jane’s hand and her mouth and gently redirect her hand back to her lap. Finally, in the pre-session attention plus response blocking condition, noncontingent positive attention was provided approximately once every 30 s and each attempt to engage in the target behavior was blocked. Sessions were conducted two to four times based on subject availability, usually two days per week, until a stable trend in the data was achieved.

Extended Pre-Session Analysis (Phase 3)

The purpose of Phase 3 was to evaluate whether 10 min and 5 min periods of access to the antecedent events produced effects similar to the 15 min pre-session conditions. Prior to the altering 10 min and 5 min pre-session conditions, a pre-intervention probe was conducted to examine the current levels of the target behavior for each participant. The probe was a 5 min no-interaction condition with no pre-session condition. The effects of 10 min and 5 min periods of the pre-session conditions on target behavior were then evaluated using the most effective pre-session condition identified in Phase 2. The levels of the target behavior were evaluated in a 5 min no-interaction condition that immediately followed 10 min or 5 min pre-session condition. One session was conducted every day for each participant.
Procedural Integrity

Evaluation of procedural integrity was conducted by randomly selecting 30% of the analysis sessions for each participant and having the secondary observer (described above) score the sessions using a checklist specific to each phase and condition (See Appendix C). Observers were trained using videos and were told what to look for and how to use the checklist. Training occurred until the experimenter and the secondary observer achieved 90% or higher agreement with their recordings of correctly implemented steps of the procedures. Following this instruction, the observers watched a video and completed the checklist. During the pre-session analysis and extended pre-session analysis, the researcher and secondary observer recorded procedural integrity data. The observers were required to record the occurrence or nonoccurrence of each procedural step on the procedural integrity checklist. These data were used to calculate a percent of procedural steps completed. For a breakdown of procedural integrity scores, IOA on treatment fidelity scores, and percentage of sessions assessed, see Table 3.2.
<table>
<thead>
<tr>
<th>Scores</th>
<th>Rosy</th>
<th>Alex</th>
<th>Jane</th>
<th>Cheri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrity of Pre-Session Analysis</td>
<td>99.9% (R=95-100%)</td>
<td>98% (R=82.9-99%)</td>
<td>98.5% (R=92.9-100%)</td>
<td>98.7% (R=94.9-100%)</td>
</tr>
<tr>
<td>IOA of Integrity</td>
<td>99.9% (R=98-100%)</td>
<td>97.2% (R=94-100%)</td>
<td>99.9% (R=98.4-100%)</td>
<td>96.9% (R=95-100%)</td>
</tr>
<tr>
<td>Percent of Coded for Integrity</td>
<td>31%</td>
<td>40%</td>
<td>32%</td>
<td>35%</td>
</tr>
<tr>
<td>Integrity of Extended Pre-Session Analysis</td>
<td>99.8% (R=98-100%)</td>
<td>99.6% (R=94.2-99%)</td>
<td>97.6% (R=91.7-100%)</td>
<td>99.3% (R=93.3-99.8%)</td>
</tr>
<tr>
<td>IOA of Integrity</td>
<td>100% (R=97-100%)</td>
<td>98% (R=96.5-100%)</td>
<td>98.6% (R=95-100%)</td>
<td>98.4% (R=95-100%)</td>
</tr>
<tr>
<td>Percent of Coded for Integrity</td>
<td>35%</td>
<td>37%</td>
<td>38%</td>
<td>32%</td>
</tr>
</tbody>
</table>

*R refers to range.

Table 3.2: Procedural integrity for Rosy, Alex, Jane, and Cheri across all phases including total percent of sessions coded and IOA on integrity per participant
Social Validity

A social validity questionnaire (Appendix E) was provided to relevant consumers (e.g., teachers, aides, and parents) to assess the social acceptability of the goals, procedures, and outcomes of the current study. The questionnaire used a 5-point Likert-type scale. One question was open–ended and provided relevant consumers the opportunity to write additional comments. The relevant consumers were asked to complete and submit the questionnaire anonymously.
CHAPTER 4

RESULTS

In this chapter, the results of each phase of the study will be presented. In the first section, the results of the functional analysis will be described for Rosy, Alex, Jane, and Cheri. In the next section, the results from the pre-session analysis will be presented. Finally, the results from the extended pre-session analysis will be discussed.

Phase 1: Functional Analysis

*Rosy*

Results of the functional analysis for Rosy are shown in Figure 4.1. Rosy engaged in mouth tapping in a fairly high percentage of the time in the no interaction condition with a stable trend (mean=51.3%, range=33–62%), and in very low percentages of the time in the demand (mean=1.6%, range=0–9.5%), attention (mean=0.4%, range=0–1%), and play (mean=1%, range=0–4%) conditions. When the extended no interaction conditions were run, she engaged in the target behavior 49.7% of the time. The differentiated results suggested that Rosy’s mouth tapping was likely maintained by automatic reinforcement.
Figure 4.1. Functional analysis results for Rosy

Alex

The results of the functional analysis for Alex are shown in Figure 4.2. Higher levels of string play were observed in the no interaction condition (mean=61.3\%, range=0–99\%) than in the other conditions. Low levels of string play were observed in the attention (mean=0.7\%, range=0–2\%), play (mean=1\%, range=0–3.7\%), and demand (mean=8.4\%, range=0–18.7\%) conditions. When the extended no interaction conditions were run, he engaged in the target behavior in 31.3\% of the time (range=11.3-93.3\%)
with an increasing trend. These results suggest that Alex’s string play was maintained primarily by automatically reinforcement.

![Figure 4.2. Functional analysis results for Alex](image)

**Jane**

Results of Jane’s functional analysis are shown in Figure 4.3. Jane displayed high, stable levels of hand and object mouthing during the no interaction condition (mean=93.3%, range=80–100%). When the extended no interaction conditions were run,
she engaged in the target behavior in 100% of the time. Jane displayed low levels of hand
and object mouthing during the attention (mean=29.6%, range=0–80%) and demand
conditions (mean=48%, range=0–100%). High levels of hand and object mouthing were
consistently observed during the first four play sessions. However, engagement in the
target behavior significantly decreased after the fourth session and remained at low levels
during the remaining play condition sessions. The overall levels of the target behavior in
the play condition were lower (mean=54.5%, range=11.6–96.7%) than they were in the
no interaction condition. These results suggested that Jane’s hand and object mouthing
were likely maintained by automatically reinforcement.
Cheri engaged in the most shirt playing and hand viewing in the no interaction condition (mean=56.6%, range=6–99%). Low levels of the target behavior were observed in the demand (mean=4.6%, range=0–10.2%), attention (mean=2.7%, range=0–5.3%), and play (mean=1.4%, range=0–6.7%) condition sessions. When the extended no interaction conditions were run, she engaged in shirt playing and hand viewing 58.9% of the time (range=45–75%). These results suggest that the target behavior was maintained primarily by automatically reinforcement.
The results of Phase 1 showed that for Rosy, Alex, Jane, and Cheri, the target behaviors occurred at the highest levels in the no interaction condition and maintained or increased in the extended no interaction conditions. The results of the functional analysis for all participants support the conclusion that the behavior was maintained by automatic reinforcement. Subsequent pre-session analyses (Phase 2) were used to determine the effects of four pre-session conditions on the target behaviors maintained by automatic reinforcement.

Phase 2: Pre-Session Analysis

Rosy

For Rosy, all but the attention condition acted as an AO for mouth tapping when compared to the no interaction condition from the functional analysis. Following the no interaction condition, she engaged in mouth tapping an average of 33.2% (range=21–50%) of the time, which was an 18.1% decrease from the no interaction condition in the functional analysis. Following pre-session response blocking, she engaged in mouth tapping an average of 48.9% (range=33–66.3%) of the time. This was a 2.4% decrease from the functional analysis. Following pre-session attention plus blocking, she engaged in the target behavior an average of 50.9% (range=22.3–77.3%) of the time, which represents only a 0.4% decrease in mouth tapping. These data paths indicate a slight decreasing trend. For Rosy, the most effective AO was pre-session no interaction condition.
When the pre-session analysis was conducted for Alex, an AO was observed with the no interaction and response blocking conditions, and an EO was observed with the attention and attention plus blocking conditions. Following the no interaction condition, he played with the cotton string an average of 28.3% (range=1–65.3%) of the time. This was a 33% mean decrease from the functional analysis and showed a slightly decreasing
trend. Following pre-session response blocking, he engaged in the target behavior an average of 51.3% (range=13.3–73%) of the time. This was a 10% decrease from the functional analysis. Following pre-session attention, he engaged in string playing an average of 67.2% (range=47–89.3%) of the time, which represents a 5.9% increase in the target behavior from the functional analysis. Finally, following pre-session attention plus response blocking, he displayed string playing an average of 67.9% (range=59.3–90%) of the time, which was a 6.6% increase in the target behavior from the functional analysis. For Alex, the most effective AO was pre-session no interaction condition.

Figure 4.6. Results of the pre-session analysis for Alex
Jane

For Jane, the response blocking and attention plus response blocking conditions acted as AOs for hand and object mouthing, while the no interaction and attention condition acted as EOs. Following the response blocking condition, she engaged in the target behavior an average of 38.6% (range=0–86.3%) of the time, which was a 54.7% decrease over the no interaction condition in the functional analysis and showed a steep decreasing trend. Following pre-session attention plus response blocking, she engaged in the target behavior an average of 82.4% (range=65–100%) of the time. This was a 10.9% decrease from the functional analysis. Following pre-session no interaction, she engaged in hand and object mouthing an average of 100% of the time, which represents a 6.7% increase in the target behavior. Finally, following pre-session attention, she engaged in the target behavior an average of 94.6% (range=81–100%) of the time. This was a 1.3% increase over the functional analysis. For Jane, the most effective AO was pre-session response blocking condition.
For Cheri, all but the attention plus response blocking condition acted as an EO for the target behavior when compared to the no interaction condition of the functional analysis. Following the pre-session no interaction condition, she engaged in challenging behavior an average of 79.5% (range=35.3–99%) of the time, which was a 19.3% increase from the no interaction condition in the functional analysis. Following pre-
session response blocking, she engaged in mouth tapping an average of 60.4% (range=21.3–80%) of the time. This was a 3.8% increase from the functional analysis. Following pre-session attention, she engaged in the target behavior an average of 65.7% (range=16.7–100%) of the time, which represents a 9.1% increase in mouth tapping. Following pre-session attention plus blocking, she engaged in the target behavior an average of 46.5% (range=10–91.2%) of the time, which represents a 10.1% decrease in that behavior. For Cheri, the most effective AO was pre-session attention plus blocking condition.

Figure 4.8. Results of the pre-session analysis for Cheri
Table 4.1 summarizes the results from the pre-session analysis for each participant. A pre-session effect was considered significant when the value of was over 20%, moderate when the value was between 10 and 20%, weak when the value was less than 10% and no effect when the value was less than 2%.

<table>
<thead>
<tr>
<th>No-interaction</th>
<th>Blocking</th>
<th>Attention</th>
<th>Attention &amp; Blocking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO (Moderate, 18.1%)</td>
<td>AO (Weak, 2.4%)</td>
<td>No effect (1.9%)</td>
<td>No effect (0.4%)</td>
</tr>
<tr>
<td>Alex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO (Significant, 33%)</td>
<td>AO (Moderate, 10%)</td>
<td>EO (Weak, 5.9%)</td>
<td>EO (Weak, 6.6%)</td>
</tr>
<tr>
<td>Jane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EO (Weak, 6.7%)</td>
<td>AO (Significant, 54.7%)</td>
<td>No effect (1.3 %)</td>
<td>AO (Moderate, 10.9%)</td>
</tr>
<tr>
<td>Cheri</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EO (Moderate, 19.3%)</td>
<td>EO (Weak 3.8%)</td>
<td>EO (Weak, 9.1 %)</td>
<td>AO (Moderate, 10.1 %)</td>
</tr>
</tbody>
</table>

Note: A pre-session effect was considered significant when the value of percentage change was over 20%, moderate when the value was between 10 and 20%, weak when the value was less than 10% and no effect when the value was less than 2%.

Table 4.1: Summary of pre-session effects for Rosy, Alex, Jane, and Cheri
Pre-session access to the target behavior (i.e., no interaction) acted as a moderate to significant AO for Rosy and Alex, but as a moderate to significant EO for Jane and Cheri. Pre-session access to response blocking acted as a weak to significant AO for Rosy, Alex, and Jane, and acted as a weak EO for Cheri. When pre-session noncontingent positive attention was provided, engagement in the target behavior increased in 2 participants with weak effects. Finally, pre-session access to noncontingent positive attention and response blocking acted as a weak to moderate AO for Jane and Cheri, but acted as a weak EO for Alex. It is important to note that an AO is more socially significant, as we want to see decreases in challenging behavior. The results of pre-session effect are also depicted in Figure 4.9 to help visual analysis.

Figure 4.9. Results of pre-session effects for Rosy, Alex, Jane, and Cheri
Phase 3: Extended Pre-Session Analysis

Rosy

Before the extended pre-session analysis, one data point was collected to evaluate the occurrence of the target behavior when there was no pre-session access to any conditions (i.e., a reversal probe). For Rosy, during the reversal condition she engaged in mouth tapping 64% of the time. This was a 12.7% increase over the no interaction condition in the functional analysis. Therefore, the levels of the target behavior were high when pre-session access to the behavior was not provided prior to test conditions. When pre-session access to the behavior was provided, the results showed that 10 min and 5 min of pre-session access to mouth tapping led to similar effects as the 15 min pre-session condition (mean=33.2%). Following the 10 min no interaction condition, Rosy engaged in the target behavior an average of 27% (range=24.3–28.7%) of the time, which was a 24.3% decrease over the no interaction condition in the functional analysis and showed a fairly stable trend. Following the 5 min no interaction condition, Rosy engaged in the target behavior an average of 31.2% (range=22–51.3%) of the time, which was a 20.1% decrease over the no interaction condition in the functional analysis and showed a very stable trend. The results from this analysis are shown in Figure 4.10.
Figure 4.10. Results of the extended pre-session analysis for Rosy

**Alex**

The results from the treatment analysis for Alex are shown in Figure 4.11. During the no pre-session condition reversal, he engaged in string play an average of 49.3% of the time. Although the level of the target behavior was high, this was a 12% mean decrease from the functional analysis. When pre-session access to the behavior was provided, the results showed that 10 min and 5 min of pre-session access to string play
led to an even greater mean decrease than the 15 min pre-session condition (mean=28.3%). Following the 10 min no interaction condition, Alex engaged in the target behavior an average of 10.9% (range=7.3–15 %) of the time, which was a 50.4% decrease from the no interaction condition in the functional analysis. Following the 5 min no interaction condition, Alex engaged in the target behavior an average of 17.4% (range=12–25.7%) of the time, which was a 43.9% decrease from the no interaction condition in the functional analysis and showed a stable trend.

Figure 4.11. Results of the extended pre-session analysis for Alex
Figure 4.12 shows the results of the treatment analysis for Jane. During the reversal condition, she engaged in hand and object mouthing 100% of the time, which was a 6.1% increase over the no interaction condition in the functional analysis. When pre-session access to the behavior was provided, the results showed that 10 min and 5 min of pre-session access to hand and object mouthing led to significantly different effects compared to the 15 min pre-session condition (mean=38.6% decrease). Following the 10 min no interaction condition, Jane engaged in the target behavior an average of 3.5% (range=0–13.3%) of the time, which was a 90.4% decrease over the no interaction condition in the functional analysis and showed a decreasing trend. Following the 5 min no interaction condition, Jane engaged in the target behavior an average of 61% (range=0–89%) of the time, which was a 32.3% decrease over the no interaction condition in the functional analysis and showed increasing trend. Collectively, the 10 min pre-session condition (i.e., a 90.4% mean decrease) was more effective than the 15 min pre-session condition (i.e., a 54.7% mean decrease). In contrast, the 5 min pre-session condition only resulted in 32.3% mean decrease and showed an increasing trend.
Figure 4.12. Results of the extended pre-session analysis for Jane

Cheri

The results from treatment analysis for Cheri are shown in Figure 4.13. Cheri engaged in shirt playing and hand viewing an average of 90.7% of the time during the reversal condition. This represented a 34.1% increase from the no interaction condition in the functional analysis. When pre-session access to the behavior was provided, the results showed that 10 min and 5 min of pre-session access to attention plus blocking led to similar effects as 15 min pre-session condition (mean=46.5%). Following the 10 min no
interaction condition, Cheri engaged in the target behavior an average of 31.7% (range=11.7–45%) of the time, which was a 24.9% decrease over the no interaction condition in the functional analysis. Following the 5 min no interaction condition, she engaged in the target behavior an average of 41.5% (range=15.7–86.7%) of the time, which was a 15.1% decrease over the no interaction condition in the functional analysis and showed an increasing trend. Compared to the 15 min pre-session condition (i.e., a 10.1% mean decrease from the no interaction condition in the functional analysis), 10 min and 5 min no interaction conditions were slightly more effective.

Figure 4.13 Results of the extended pre-session analysis for Cheri
Social Validity

A social validity questionnaire was sent to each of the participants' classroom teachers and each questionnaire was returned. One social validity questionnaire was delivered to each participant's parents or guardians and one questionnaire was returned. The questionnaire was comprised of eleven questions for teachers and eight questions for parents that used a 5-point Likert type scale. The questionnaires contained questions regarding the importance of having a goal to address manipulating environmental conditions to decrease automatically maintained behavior. There were also questions regarding the duration of implementing the most effective environmental condition. Finally, there were questions regarding the perception of improvement in the participant's behavior after pre-session access to the most effective condition was provided. Teachers and parents were given a summary of the procedures and results of the study, including copies and descriptions of the current study in order to answer questions on the social validity questionnaire. The breakdowns of the mean scores across questions are reported in Table 4.2 for teachers’ responses and Table 4.3 for the parent’s responses.
1. Automatically maintained behavior (i.e., behavior maintained by engaging in that behavior itself) is often difficult to assess and treat due to the intrinsic reinforcement provided by the behavior. One of the goals of this study was to initially identify whether your child’s stereotypic behavior was automatically maintained. Do you think that it is important to identify what is maintaining your student’s stereotypic behavior?

2. Another goal of this study was to determine the effects of four different environmental conditions on automatically maintained behavior. Do you think that it is important for students with automatically maintained behavior to be exposed to different environmental conditions that might decrease the behavior?

3. A final goal was to determine for how much time we should provide the environmental condition that would lead to the lowest occurrence of automatically maintained behavior. Do you think that it is important to address how long we should provide the environmental condition?

4. In the study, one procedure used to address the above goals was to determine which one of the four environmental conditions led to the lowest occurrence of automatically maintained behavior. Do you think this it is practical for you to implement this procedure?

5. Would you be willing to implement this procedure?

6. Another procedure was to determine whether shorter periods (i.e., 10 minutes or 5 minutes) can lead to similar effects as longer periods (i.e., 15 minutes). Do you think this it is practical for you to implement this procedure?

7. Would you be willing to implement this procedure?

8. Would you suggest implementing either of these procedures to teachers/staffs if they wanted to address goals similar to those above if their students had a similar behavior?

9. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the most effective pre-session environmental condition was provided?

10. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the shorter periods of pre-session environmental condition were provided?

11. Did your students enjoy participating in the study?

<table>
<thead>
<tr>
<th>Social Validity Questions for Teachers/Staff</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Automatically maintained behavior (i.e., behavior maintained by engaging in that behavior itself) is often difficult to assess and treat due to the intrinsic reinforcement provided by the behavior. One of the goals of this study was to initially identify whether your child’s stereotypic behavior was automatically maintained. Do you think that it is important to identify what is maintaining your student’s stereotypic behavior?</td>
<td>4.8</td>
</tr>
<tr>
<td>2. Another goal of this study was to determine the effects of four different environmental conditions on automatically maintained behavior. Do you think that it is important for students with automatically maintained behavior to be exposed to different environmental conditions that might decrease the behavior?</td>
<td>4.5</td>
</tr>
<tr>
<td>3. A final goal was to determine for how much time we should provide the environmental condition that would lead to the lowest occurrence of automatically maintained behavior. Do you think that it is important to address how long we should provide the environmental condition?</td>
<td>4.3</td>
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<tr>
<td>4. In the study, one procedure used to address the above goals was to determine which one of the four environmental conditions led to the lowest occurrence of automatically maintained behavior. Do you think this it is practical for you to implement this procedure?</td>
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<td>5. Would you be willing to implement this procedure?</td>
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<tr>
<td>6. Another procedure was to determine whether shorter periods (i.e., 10 minutes or 5 minutes) can lead to similar effects as longer periods (i.e., 15 minutes). Do you think this it is practical for you to implement this procedure?</td>
<td>4</td>
</tr>
<tr>
<td>7. Would you be willing to implement this procedure?</td>
<td>3.5</td>
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<tr>
<td>8. Would you suggest implementing either of these procedures to teachers/staffs if they wanted to address goals similar to those above if their students had a similar behavior?</td>
<td>3.8</td>
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<tr>
<td>9. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the most effective pre-session environmental condition was provided?</td>
<td>4</td>
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<tr>
<td>10. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the shorter periods of pre-session environmental condition were provided?</td>
<td>4</td>
</tr>
<tr>
<td>11. Did your students enjoy participating in the study?</td>
<td>4</td>
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</tbody>
</table>

Table 4.2: Mean scores of social validity questionnaire for teachers.
Social Validity Questions for Parents

1. Automatically maintained behavior (i.e., behavior maintained by engaging in that behavior itself) is often difficult to assess and treat due to the intrinsic reinforcement provided by the behavior. One of the goals of this study was to initially identify whether your child’s stereotypic behavior was automatically maintained. Do you think that it is important to identify what is maintaining your child’s stereotypic behavior?

2. Another goal of this study was to determine the effects of four different environmental conditions on automatically maintained behavior. Do you think that it is important for children with automatically maintained behavior to be exposed to different environmental conditions that might decrease the behavior?

3. A final goal was to determine for how much time we should provide the environmental condition that would lead to the lowest occurrence of automatically maintained behavior. Do you think that it is important to address how long we should provide the environmental condition?

4. In the study, one procedure used to address the above goals was to determine which one of the four environmental conditions led to the lowest occurrence of automatically maintained behavior. Do you think this it is practical for your child’s teacher to implement this procedure?

5. Another procedure was to determine whether shorter periods (i.e., 10 minutes or 5 minutes) can lead to similar effects as longer periods (i.e., 15 minutes). Do you think this it is practical for your child’s teacher to implement this procedure?

6. Would you suggest implementing either of these procedures to parents if they wanted to address goals similar to those above if their students had a similar behavior?

7. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the most effective pre-session environmental condition was provided?

8. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the shorter periods of pre-session environmental condition were provided?

<table>
<thead>
<tr>
<th>Social Validity Questions for Parents</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Automatically maintained behavior (i.e., behavior maintained by engaging in that behavior itself) is often difficult to assess and treat due to the intrinsic reinforcement provided by the behavior. One of the goals of this study was to initially identify whether your child’s stereotypic behavior was automatically maintained. Do you think that it is important to identify what is maintaining your child’s stereotypic behavior?</td>
<td>5</td>
</tr>
<tr>
<td>2. Another goal of this study was to determine the effects of four different environmental conditions on automatically maintained behavior. Do you think that it is important for children with automatically maintained behavior to be exposed to different environmental conditions that might decrease the behavior?</td>
<td>5</td>
</tr>
<tr>
<td>3. A final goal was to determine for how much time we should provide the environmental condition that would lead to the lowest occurrence of automatically maintained behavior. Do you think that it is important to address how long we should provide the environmental condition?</td>
<td>5</td>
</tr>
<tr>
<td>4. In the study, one procedure used to address the above goals was to determine which one of the four environmental conditions led to the lowest occurrence of automatically maintained behavior. Do you think this it is practical for your child’s teacher to implement this procedure?</td>
<td>5</td>
</tr>
<tr>
<td>5. Another procedure was to determine whether shorter periods (i.e., 10 minutes or 5 minutes) can lead to similar effects as longer periods (i.e., 15 minutes). Do you think this it is practical for your child’s teacher to implement this procedure?</td>
<td>5</td>
</tr>
<tr>
<td>6. Would you suggest implementing either of these procedures to parents if they wanted to address goals similar to those above if their students had a similar behavior?</td>
<td>5</td>
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<tr>
<td>7. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the most effective pre-session environmental condition was provided?</td>
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</tr>
<tr>
<td>8. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the shorter periods of pre-session environmental condition were provided?</td>
<td>5</td>
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Table 4.3: Mean scores of social validity questionnaire for parents
CHAPTER 5

DISCUSSION

This chapter discusses the results relative to the study purposes presented in Chapter 1, identifies limitations of the study, suggests implications for practice, and offers recommendations for future research.

The purposes of this study were to investigate the extent to which manipulating pre-access to social and/or non-social reinforcement contributes to the decrease of automatically maintained challenging behavior (i.e., has a positive effect or functions as an AO) and the extent to which manipulating the duration of the most effective pre-access condition contributes to the occurrence of the behavior.

The results of initial functional analyses demonstrated that the behavior of all four participants was maintained primarily by automatic reinforcement. The subsequent pre-session analysis conducted in Phase 2 was used to determine the effects of four pre-session conditions on that behavior. Pre-session no interaction acted as an AO for the target behavior for 2 participants but as an EO for the other 2 participants. Pre-session response blocking acted as an AO for automatically maintained behavior in 3 participants but as an EO in 1 participant. The effects of pre-session attention functioned as an EO for 2 participants. Pre-session response blocking and attention plus blocking acted as an AO for automatically maintained behavior in 2 participants but as an EO in 1 participant. The
results of extended pre-session analysis conducted in Phase 3 suggested that 10 min and 5 min periods of pre-access to the most effective AO condition identified in Phase 2 produced effects similar to the 15 min pre-session conditions in 3 participants. For the remaining participant, 5 min of pre-session access was not as effective as 10 min and 15 min pre-session access.

Discussion of Results by Research Question

Research Question 1: What are the effects of pre-session exposure to the automatically maintained challenging behavior on the frequency of behavior across four individuals with developmental disabilities?

In this study, pre-session exposure to the automatically maintained challenging behavior (i.e., no interaction) decreased the later engagement in that behavior (i.e., functioned as an AO) for Rosy and Alex. In contrast, the same exposure increased the subsequent frequency of automatically maintained challenging behavior (i.e., functioned as an EO) for Jane and Cheri. The results both replicate and contradict Rapp’s (2004) findings, which noted that the pre-session alone condition functioned as an AO for automatically maintained behavior. Several factors, including procedural differences, might contribute to the inconsistent results. First, Rapp stated that his study was the first to examine the effects of pre-session access to automatically maintained behavior on the subsequent engagement in that behavior. However, a functional analysis was not used to confirm the maintaining consequences of the target behavior. In this study, a functional analysis was conducted to identify participants whose stereotypic behavior was automatically maintained. Given that pre-session access to automatically maintained
behavior might function as either an AO or EO for the subsequent occurrences of that behavior, the findings of this study suggested the need for conducting functional analyses before making a conclusion of MO influence on automatically maintained behavior. It is possible that for some automatically maintained behavior, 15 min pre-session access to that behavior might act as an EO instead of AO. In this study, pre-session no interaction was sufficient to decrease automatically maintained behavior for Rosy and Alex. However, following 15 min pre-session no interaction, Jane consistently engaged in 100% hand or object mouthing during every 5 min test condition. The finding was also confirmed by the staff numbers who closely worked her. They reported that if they did not redirect Jane into other tasks, she would put her hands or an object, especially the chewy, in her mouth for whole day. This also suggested the importance of conducting a pre-session analysis before implementing an intervention.

Second, although pre-session exposure to the automatically maintained behavior was provided in Rapp (2004) and the current study, the settings were different. In Rapp’s study, the participant was alone in a room; in this study, the researcher was present throughout sessions. Recall from Chapter 2 that Laraway et al. (2003) and Michael (2007) stated that the change in the frequency of a behavior (i.e., behavior-altering effect) can actually come from two sources. It can be a direct influence that is produced by the value-altering effect or an indirect influence that is generated by changing the effectiveness of relevant discriminative stimuli (i.e., \( S^D \)). In the current study, it is possible that the presence of the researcher increased the effectiveness of pre-session access to automatically maintained behavior, and therefore indirectly resulted in higher
levels of the behavior during the following test conditions. Take Cheri for example, when compared to the no interaction condition from the functional analysis, she engaged in 19.3% higher levels of shirt playing and hand viewing during the test conditions in the presence of the researcher. This suggested that the effectiveness of the $S^D$ might increase via the increase in the frequency of the target behavior. Rapp’s study, on the other hand, may be conceptualized as examining the direct influence produced by value-altering effect on automatically maintained behavior. Future research might consider comparing the direct and indirect influence on the same automatically maintained behavior.

Although the influence of the $S^D$ might change the frequency of a behavior, it is also possible that satiation conditions were not created for Jane and Cheri, whose automatically maintained behavior increased after the pre-session no-interaction condition. In Rapp (2004), the participant was alone for 30 min, whereas the participants in this study were provided with 15 min of no interaction. For Rosy and Alex, it was clear that 15 min pre-session no interaction functioned as an AO for their automatically maintained behavior. However, for Jane and Cheri, 15 pre-session exposures were not sufficient and did not create satiation status. Future studies might examine the effects of pre-session access to automatically maintained behavior using various periods until satiation has been established.

Another procedural difference between previous research and this study involved the time between the pre-session and test conditions. In Rapp (2004), 3 hours passed between the first daily session (i.e., pre-session condition) and the second daily session (i.e., test condition). In this study, each 15 min pre-session condition was immediately
followed by a 5 min test condition. One defining feature of an MO is that the two altering
effects are momentary. That is, once the MO is removed or reduced, the value of a given
consequence may be re-established, and the frequency of behavior may return.

Lindberg and colleagues (2003) were among the few who investigated the short-
term versus long-term therapeutic effects of NCR in 5 individuals with mental retardation.
They found that the brief sessions of NCR decreased SIB for all 3 participants. However,
the long-term effect of NCR on decreasing SIB was observed for only 1 participant. For
the other 2 participants, their manipulation of the preferred items decreased and SIB
increased during extended sessions. In other words, NCR functioned as an AO for SIB
for the 3 participants during brief test sessions, but the effects did not maintain for 2 of
the 3 participants during extended sessions. The findings illustrate that for these 2
participants, once the EO for SIB returned, the decreased SIB returned. Therefore, it is
important to evaluate the effects of pre-session conditions on a given behavior that
immediately follows, as well as sessions temporally remote from the pre-session access
(Horner et al., 1997). Rapp’s study provided the evidence that MO manipulations may
have long-term remote effects on automatically maintained behavior. The results of the
pre-session analysis for Jane and Alex in the current study add to the literature by
demonstrating the temporally close effects of pre-session access to automatically
maintained behavior, because the test conditions were immediately conducted after the
pre-session exposure. One advantage of knowing the immediate effects produced by a
given pre-session exposure is that the more accurate prediction about the frequency of
challenging behavior right after a given MO was manipulated. For the long-term effects,
it seems difficult to determine when the test condition has to be delayed from the pre-
session condition. Given that inconsistent findings in existing studies, more research
along this line is still needed.

*Research Question 2: What are the effects of pre-session exposure to response blocking
the frequency of automatically maintained behavior across four individuals with
developmental disabilities?*

If a deprivation condition was established following a certain period of response
blocking of automatically maintained behavior, an EO effect would be shown via an
increased engagement in that behavior. For example, Rapp (2006) found that response
blocking functioned as an EO for automatically maintained object tapping. However, in
the current study, response blocking functioned as a weak to significant AO for Rosy,
Alex, and Jane but served as an EO for Cheri. A similarity between Rapp’s study and this
study were that each of the pre-session conditions was 15 min and the test conditions
were conducted immediately after the pre-session condition. Therefore, the MO effects
were evaluated right after pre-session exposure but the results were very different. Two
potential factors might explain the inconsistent findings. First, the period of each test
condition was 5 min in the current study but was 15 min in Rapp’s study. It is possible
that response blocking initially functioned as an AO during the brief 5 min test condition
but as an EO over time (i.e., 15 min test condition). However, the produced AO effect
after 5 min was not evaluated in the current study. Future studies might consider
examining the effects of a set duration of pre-session response blocking on automatically
maintained behavior during short-term and long-term test conditions.
Second, in Rapp’s (2006) study, the MO effects on the target behavior during the test condition were directly compared with occurrences of that behavior during the 15 min pre-intervention component, which occurred prior to the 15 min response blocking condition. However, in the current study, the pre-intervention component was not included. Future studies might examine whether different compared reference may generate different results.

For some participants, the decreased automatically maintained behavior might shift to the engagement of other non-targeted behaviors. It was found, for example, that Jane rubbed her face or legs more frequently after the target behavior was blocked during pre-session sessions. Similarly, Alex patted on his arm or put his head on his arm after string playing was blocked for 15 min. Therefore, future studies should evaluate effects of pre-session response blocking on shifts in response allocation.

Finally, it is also possible that the blocking procedure itself provided matched stimulation for automatically maintained behavior. In this study, all participants’ target behaviors involved using hands to contact author body part (e.g., mouth) or an object (e.g., the string, shirt). The pre-session response blocking involved using the researcher’s hands to redirect the participants’ automatically maintained behavior. If the physical contact generated by the blocking procedure could produce stimulation that was functionally similar to the stimulation generated by automatically maintained behavior, these findings (i.e., pre-session blocking functioned as an AO for 3 participants) might be less surprising. However, this hypothesis should be direly tested in future studies.
Research Question 3: What are the effects of pre-session exposure to attention on automatically maintained challenging behavior across four individuals with developmental disabilities?

Studies have found that pre-session attention can influence attention maintained behavior (e.g., McComas et al., 2003; O’Reilly et al., 2006b), stereotypic behavior with undifferentiated patterns during a functional analysis (Roantree & Kennedy, 2006; Van Camp et al., 2000), and automatically maintained behavior without functional analysis results (Rapp 2007). In the current study, the results indicated that for 2 participants, pre-session attention functioned as an EO for automatically maintained behavior with confirmation from the functional analysis.

It is not surprising that noncontingent pre-session positive attention may create a satiation condition and therefore decrease the subsequent levels of a given attention maintained behavior (i.e., function as an AO). McComas et al. (2003) found that pre-session noncontingent attention acted an AO for challenging behavior that was maintained by attention but had no effect on challenging behavior that was maintained by escape. However, pre-session positive attention acted as an EO, rather than AO, for stereotypy during a subsequent functional analysis in Roantree and Kennedy’s (2006) study. The researchers found that pre-session attention was required to support that the participant’s stereotypic behavior was sensitive to attention. They argued that one implication of their findings was that pre-session attention might function as either an AO or EO, depending on the temporal relation between the pre-session manipulation and the test condition. For instance, it is possible that pre-session attention initially served as an
EO for a given behavior initially, but as an AO over time. However, this empirical question has not been answered in the literature.

Although it was not the main focus in Rapp’s (2007) study, pre-session attention was found to act an EO for automatically maintained behavior. Unlike previous studies examining positive attention, contingent verbal reprimands were evaluated in Rapp’s study and were found to increase the later engagement in vocal stereotypy for 1 participant. Despite the fact that a functional analysis was not conducted to confirm the maintaining consequences of stereotypy, Rapp’s study extended the literature by demonstrating that MO manipulations might influence functionally unrelated behavior. It was not clear whether pre-session attention might have effects on automatically maintained behavior; however, the results of the current study supported the possibility.

Positive attention in the form of verbal comments delivered every 30 s during pre-session conditions functioned as an EO for automatically maintained behavior across all participants with weak effects for Rosy and Jane and moderate effects for Alex and Cheri.

These results seem very inconsistent, but at the same time support an additional feature of MOs: the multiple effects of MOs. That is, one (or more) MO(s) may affect many behaviors, which was discussed in Chapter 2. For example, Horner et al. (1997) found that a neutralizing routine functioned as an EO for different behaviors (i.e., tangibly maintained and escape maintained behavior). Van Camp et al. (2000) found that unusual antecedent events (i.e., a specific toy, social interaction) served as EOs for stereotypic behavior that persisted in the absence of social contingencies. Collectively, the results of previous studies as well as the current study suggest that social attention
might influence many behaviors maintained by either social or non-social consequences. However, it is still unclear whether different MO effects found in the previous studies resulted from different procedures involving attention delivery during pre-session conditions. Future studies should continue to evaluate the effects of pre-session attention on challenging behaviors maintained by social and non-social consequences.

Research Question 4: What are the effects of pre-session exposure to attention plus response blocking on automatically maintained challenging behavior across four individuals with developmental disabilities?

The current study may be the first to examine the effects of pre-session exposure to attention plus response blocking on automatically maintained challenging behavior. The results suggest that the combined pre-session condition functioned as an AO for Jane and Cheri, but as an EO for Alex. The combined pre-session condition is more analogous to MOs in the natural environment (Call et al., 2005); thus, the findings might have practical implications. It is unknown whether the combined effect could be anticipated by adding isolated effects together. This might be the case for Rosy whose pre-session response blocking functioned as a weak AO with a 2.4% decrease of mouth tapping, while pre-session attention served almost as a weak EO with a 1.9% increase of the behavior when compared to the no interaction condition from functional analysis. If the EO effect was balanced out by the AO effect, a 0.5% AO effect for the target behavior should be expected. The results of the pre-session analysis showed that when the pre-session attention plus blocking was manipulated, this combined condition functioned as an AO with 0.4% decrease of Rosy’s mouth tapping, which was very close to 0.5% AO
effect that was presumed earlier. Similarly, for Jane, pre-session attention functioned as a weak EO (i.e., produced a 1.3% increase) for her hand and object mouthing, but the pre-session response blocking acted as a significant AO (i.e., with a 54.7% decrease) for that behavior. When combined, the hypothesized effect would be a 53.4% decrease, yet the combined effect led to only a 10.9% decrease. In contrast, opposite results were found for Alex and Cheri. For Alex, using the same formula used above, one might expect a 4% AO effect, but 6.6% EO effects were observed. For Cheri, an approximately 10% AO effect was found when one might expect a 23% EO effect. The findings from this study added to the literature by demonstrating that more than one MO can affect automatically maintained behavior and that combining conditions does not appear to directly equate to the sum of the separate conditions. Future research should examine the effects of combined pre-access conditions on automatically maintained challenging behavior.

Research Question 5: To what extent will previously decreased challenging behavior be maintained while the length (i.e., 10 and 5 minutes) of pre-session events is manipulated across four individuals with developmental disabilities?

For 3 participants, Rosy, Alex, and Cheri, the AO effects of the most effective pre-session condition found in Phase 2 maintained when shorter (i.e., 10 min and 5 min) pre-session condition sessions were provided. However, for Jane, the 5 min pre-session exposure to response blocking did not in a similar effect as the 15 min and 10 min pre-session conditions.

McComas and colleagues (2000) compared 10 min and 5 min pre-session continuous attention on attention maintained crying during 10 min test conditions with 1
participant. They found that 5 min pre-session exposure was sufficient to decrease the subsequent occurrence of crying during 10 min test conditions. Rapp (2004) found that providing 30 min pre-session no interaction functioned as an AO for later engagement in automatically maintained object twirling during 30 min test conditions with 1 participant. The current study showed that providing 15 min, 10 min, and 5 min pre-session no interaction had the same AO effects on automatically maintained mouth tapping and string playing during 5 min test conditions. These findings suggest that manipulating functionally related pre-session events can generate desired AO effects on challenging behavior. Similarly, 10 min and 5 min pre-session attention plus blocking conditions produced effects similar to the 15 min pre-session exposure. However, the pre-session event was not functionally related to the participant’s automatically maintained shirt playing and hand viewing. Finally, it was not clear why 5 min response blocking was not sufficient to maintain decreased hand and object mouthing for Jane. Instead, the 10 min pre-session exposure was required to maintain decreased target behavior. If the hypothesis regarding matched stimulation is true, it is possible that 10 min of contact with the researcher’s hands was sufficient enough to produce similar stimulation generated by Jane’s hand and object mouthing.

For those participants that 5, 10, or 15 minutes of pre-session access was effective, one implication is that more time may not be necessary. This is consistent with previous studies (e.g., McComas et al., 2003; Rapp, 2004) suggesting that the effects of pre-session manipulation might be equal to how long the duration exposure provided. Rapp (2004) found that providing 30 min pre-session exposure, decreased automatically
maintained object twirling last for at least 30 min. The current study found that 5 min pre-session of exposure decreased automatically maintained behavior for at least 5 min. MaCoams et al. found that the effect of 5 min pre-session exposure lasted at least 10 min. Future studies are warranted to examine how long the effects of pre-session manipulation will last.

Limitations and Future Research

There were several limitations of the current study that warrant discussion. In this section, additional recommendations of future research are also included. First, the scale of pre-session effect (i.e., significant, moderate, weak, and no effect) was arbitrarily selected. Future studies should find a better method to decide the levels of the scale. For instance, researchers might ask a participant’s teacher how much percentage decrease in challenging behavior he or she considers as significant, moderate, weak, or no effect.

Next, the results of the pre-session analysis suggested that pre-session access to attention plus response blocking was the only pre-session condition that functioned as an AO for Cheri’s stereotypic behavior. However, the data pattern was undifferentiated. All but data from the pre-session attention and response blocking conditions displayed increasing trends, suggesting that another unknown motivating variable may have been in effect. Based on informal observation, the types of shirts she wore might explain the increasing trends. It was found that when Cheri wore a turtleneck, her shirt playing was less likely. In contrast, when she wore a regular summer T-shirt, the target behavior was more likely. Future research should consider controlling for potentially extraneous variables, so that the effects of the pre-session manipulations could be seen more clearly.
Additionally, although an increasing trend was not observed during the pre-session attention plus blocking analysis for Cheri, an unstable data path was shown. Therefore, another limitation for the current investigation might be that pre-session access to alternative stimuli was not included in the analysis. It is possible that providing alternative stimuli could generate more stable AO effects. Future studies should consider identifying the most effective pre-session that produces consistent change in the frequency of automatically maintained behavior when inconclusive outcomes are observed during the initial pre-session analysis.

Another limitation of the current study, as described earlier, was that the no interaction condition from the functional analysis sessions was used as a reference (i.e., baseline data) for comparison. Therefore, the levels of automatically maintained behavior during test conditions were not directly compared to the levels of that behavior immediately prior to pre-session manipulation. Future research might consider evaluating the target behavior during three successive components within a reversal design (Rapp, 2007) to see if different results would be found.

Another limitation of the current study was that the length of the pre-session condition was arbitrarily selected when taking into account the need of clinic practice and the findings from the literatures. In previous studies, pre-session conditions lasted between from 5 and 30 min; however, the criteria for the decision were unknown. In the current study, as discussed earlier, 15 min pre-session no interaction was not sufficient to function as an AO for Jane and Cheri’s subsequent engagement in automatically maintained behavior. The amount of the time needed for pre-session manipulations to
decrease automatically maintained behavior is still not clear and warrants discussion in the future studies. Similarly, the duration of test conditions was arbitrarily determined, and the analysis of longer duration of pre-session manipulation was not included in this study. Future studies should examine both the short-term and long-term MO effects after the most effective pre-session has been identified.

A final limitation was that two of the participants’ teachers reported that the findings of this study were not very practical for two reasons. One was that there was always one-on-one interaction between the participant and the researcher, which might be difficult for a teacher to provide. The other reason was that although the automatically maintained behavior decreased, the behavior might not be a main concerned for educators. Instead, appropriate response (i.e., task performance) should be included in the pre-session analysis. Thus, future research might evaluate the effects of pre-session conditions on other academic related behaviors during different test condition.

Implications for Practice

This study has several implications. First, automatically maintained behavior is often hard to treat due to the intrinsic reinforcement produced by that behavior (LeBlanc et al., 2000); however, based on the findings of the current study, not only non-social but social pre-session conditions might influence automatically maintained behavior. The findings of this study suggest that pre-session manipulations may provide teachers or therapists an alternative intervention, especially when it is impractical to withhold the sensory consequence (Rapp, 2004). Second, pre-session manipulation offers an effective and efficient intervention strategy. As described previously, there was an 18.1, 33, 54.7,
and 10.1% decrease in challenging behavior for Rosy, Alex, Jane, and Cheri, respectively, when 15 min pre-session access to the most effective condition was provided. The intervention was efficient, because the decreased levels of challenging behavior remained low when the duration of pre-session exposure was shortened. Therefore, pre-session manipulation is practical because in order to decrease challenging behavior, teachers simply provide about 5 min pre-session access to the identified condition. Third, pre-session manipulation does not require teachers or staff to change their teaching techniques. It requires the use of 5 min period and the arrangement of them into their daily schedule. Finally, the success of finding possible AOs is important to establish evidence-based strategies related to the development of effective intervention. An increasing number of studies have examined the effectiveness of MO manipulation on challenging behavior; however, the intervention is not systematically used in the natural settings. In addition, it is important to note that the most effective pre-session intervention condition has to be individualized through experimental analyses. Arbitrarily selected pre-session conditions might produce undesired results. For example, it was found that for Rosy and Alex, pre-session no-interaction condition decreased the later engagement of their challenging behaviors. However, the same condition increased Cheri’s challenging behavior about 19.3%. Training of teachers and therapists to correctly identify and implement pre-session interventions will need to take place.

In sum, the current study contributed to the literature by (a) confirming the maintaining consequences of behavior targeted through a functional analysis, (b) simultaneously examining the separate, combined, and multiple effects of social and non-
social antecedent events on automatically maintained behavior, and (c) evaluating the
effects of various durations of pre-session access, an important dimension of pre-session
conditions, on automatically maintained behavior. However, more research is required to
further analyze the effects of pre-session manipulation on automatically maintained
behavior in terms of (a) different MO effects across participants, (b) the possible effects
of various durations of both pre-session and test conditions, and (c) the generalization of
the study outcomes.
REFERENCES


APPENDIX A

CONSENT FOR PARTICIPATION
Dear Parents,

We would like to include your child in a study that will examine various ways of decreasing stereotypic behavior, such as hand mouthing, flapping, etc. The attached consent form provides an overview of what we are proposing, how long we would like to work with your child, and the possible outcomes for your child. I will be leading this project with the assistance of my graduate students. Please review the consent form. If you would like more information or have any questions, please feel free to contact me at the phone number or email address below. If you would like for your child to participate in this study, please sign the attached consent form and return it to me in the enclosed self-addressed, stamped envelope.

Thank you for your time and attention.
Helen I. Malone, Ph.D.
Assistant Professor
The Ohio State University
348A PAES Building
305 W 17th Avenue
Columbus OH 43210
malone.175@osu.edu
614-247-8710
SIGNING THE PARENTAL PERMISSION FORM

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

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<thead>
<tr>
<th>Printed name of subject</th>
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<thead>
<tr>
<th>Printed name of person authorized to provide permission for subject</th>
<th>Signature of person authorized to provide permission for subject</th>
<th>AM/PM</th>
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<th>Date and time</th>
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</table>

**Investigator/Research Staff**

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

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<tbody>
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101
APPENDIX B

DATA SHEETS FOR RECORDING TARGET BEHAVIORS
### Phase 1: Functional Analysis

<table>
<thead>
<tr>
<th>Session # 1</th>
<th>Duration (Seconds)</th>
</tr>
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<tbody>
<tr>
<td>Attention</td>
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</tr>
<tr>
<td>300s x 100%</td>
<td></td>
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</table>

<table>
<thead>
<tr>
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<th>Duration (Seconds)</th>
</tr>
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<tbody>
<tr>
<td>Play</td>
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</tr>
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<td>300s x 100%</td>
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<table>
<thead>
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<th>Duration (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>No-interaction</td>
</tr>
<tr>
<td>300 x 100%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
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<th>Duration (Seconds)</th>
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<tbody>
<tr>
<td>No-interaction</td>
<td>Demand</td>
</tr>
<tr>
<td>300s x 100%</td>
<td></td>
</tr>
</tbody>
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<table>
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<th>Session # 5</th>
<th>Duration (Seconds)</th>
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</thead>
<tbody>
<tr>
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<td>No-interaction</td>
</tr>
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<td>300s x 100%</td>
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<table>
<thead>
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<td>300s x 100%</td>
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<table>
<thead>
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<tbody>
<tr>
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<td>No-interaction</td>
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<tr>
<td>300 x 100%</td>
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<table>
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<td>Demand</td>
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<tr>
<td>300s x 100%</td>
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<table>
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<table>
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<tr>
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<th>Duration (Seconds)</th>
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</thead>
<tbody>
<tr>
<td>Play</td>
<td>No-interaction</td>
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<tr>
<td>300s x 100%</td>
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<table>
<thead>
<tr>
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<tr>
<td>300s x 100%</td>
<td></td>
</tr>
<tr>
<td>Session #</td>
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<td>--------------------</td>
</tr>
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<tr>
<td>Duration</td>
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<td>/300s x 100%</td>
<td></td>
</tr>
<tr>
<td>Session #2</td>
<td>A + RB</td>
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<tr>
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<tr>
<td>/300s x 100%</td>
<td></td>
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<tr>
<td>Session #3</td>
<td>RB</td>
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<tr>
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<td>/300s x 100%</td>
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<td>Session #4</td>
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<td>Duration</td>
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</tr>
<tr>
<td>Session #5</td>
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<tr>
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<td>Session #6</td>
<td>RB</td>
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<td></td>
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<tr>
<td>Session #9</td>
<td>A + RB</td>
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<td>Duration</td>
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<td>/300s x 100%</td>
<td></td>
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<tr>
<td>Session #10</td>
<td>A</td>
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## EXTENDED PRE-SESSION ANALYSIS DATA SHEET

Student: ___________________ Target behavior: ___________________ Date: ______________

Primary Observer: __________ Secondary Observer: __________ IOA Session: __________

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<thead>
<tr>
<th>Date</th>
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<td>Duration</td>
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<td>______/300s x 100%</td>
</tr>
<tr>
<td>Date</td>
<td>Duration</td>
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<tr>
<td></td>
<td>(Seconds)</td>
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<tr>
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<td>______/300s x 100%</td>
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<tr>
<td>Date</td>
<td>Duration</td>
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<tr>
<td></td>
<td>(Seconds)</td>
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<tr>
<td></td>
<td>______/300 x 100%</td>
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<tr>
<td>Date</td>
<td>Duration</td>
</tr>
<tr>
<td></td>
<td>(Seconds)</td>
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<tr>
<td></td>
<td>______/300s x 100%</td>
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<tr>
<td>Date</td>
<td>Duration</td>
</tr>
<tr>
<td></td>
<td>(Seconds)</td>
</tr>
<tr>
<td></td>
<td>______/300s x 100%</td>
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<tr>
<td>Date</td>
<td>Duration</td>
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<td></td>
<td>(Seconds)</td>
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<td>Duration</td>
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<td>Duration</td>
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<td>(Seconds)</td>
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<td>Duration</td>
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<td>(Seconds)</td>
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<td>Duration</td>
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<td></td>
<td>(Seconds)</td>
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<tr>
<td></td>
<td>______/300s x 100%</td>
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</table>
APPENDIX C

PROCEDURAL INTEGRITY DATA SHEETS
# PRE-SESSION ANALYSIS PROCEDURAL INTEGRITY

**Student:** [__] **Target behavior:** [__] **Date:** [__]

**Primary Observer:** [__] **Secondary Observer:** [__]

Score + for correctly implemented  
Score – for incorrectly implemented  
Score NA if no opportunity to perform step

<table>
<thead>
<tr>
<th></th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session timer is started for 15 minutes session</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The chewy was always provided for Jane during sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The cotton string was always provided for Alex during sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nothing was provided for Rosy and Cheri during sessions</td>
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<td></td>
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</tr>
<tr>
<td><strong>No-interaction condition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimenter begins session by saying, “You have 15 minutes, you can do whatever you want”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All behavior was ignored</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session ends when timer sounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session timer is reset for 5 minutes session</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All behavior is ignored &amp; Target behavior is record</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Attention condition</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Experimenter begins session by saying, “We have 15 minutes, I am going to talk to you”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive social praise is delivered approximately once every 30 s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target behavior is ignored</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Session ends when timer sounds</td>
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<td>Session timer is reset for 5 minutes session</td>
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<tr>
<td><strong>Response blocking condition</strong></td>
<td></td>
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</tr>
<tr>
<td>Experimenter begins session by saying, “During this 15 minutes, if you do ______ (i.e., target behavior) I will stop you”</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any attempt of engaging in target behavior is blocked through redirecting the participant’s hands back to his or her lap</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior other than target behavior is ignored</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Session ends when timer sounds</td>
<td></td>
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<td>Session timer is reset for 5 minutes session</td>
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<td></td>
</tr>
<tr>
<td><strong>Attention plus blocking condition</strong></td>
<td></td>
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</tr>
<tr>
<td>Experimenter begins session by saying, “I am going talk to you for 10 (or 5) minutes. If you do ______ (i.e., target behavior) I will stop you”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive social praise is delivered approximately once every 30 s</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any attempt of engaging in target behavior was blocked through redirecting the participant’s hands back to his or her lap</td>
<td></td>
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</tr>
<tr>
<td>Session ends when timer sounds</td>
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<td>All behavior is ignored &amp; Target behavior is record</td>
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</table>
EXTENDED PRE-SESSION ANALYSIS PROCEDURAL INTEGRITY

<table>
<thead>
<tr>
<th>Student:</th>
<th>Target behavior:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Observer:</td>
<td>Secondary Observer:</td>
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</tbody>
</table>

Score + for correctly implemented
Score – for incorrectly implemented
Score NA if no opportunity to perform step

<table>
<thead>
<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session timer is started for 10 or 5 minutes session</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The chewy was always provided for Jane during sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The cotton string was always provided for Alex during sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nothing was provided for Rosy and Cheri during sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No-interaction condition *(for Rosy or Alex)*

- Experimenter begins session by saying, “You have 10 (or 5) minutes, you can do whatever you want”
- All behavior was ignored
- Session ends when timer sounds
- Session timer is reset for 5 minutes session
- All behavior is ignored & Target behavior is record

Response blocking condition *(for Jane only)*

- Experimenter begins session by saying, “During this 10 (or 5) minutes, if you do _______ (i.e., target behavior) I will stop you”
- Any attempt of engaging in target behavior is blocked through redirecting the participant’s hands back to his or her lap
- Behavior other than target behavior is ignored
- Session ends when timer sounds
- Session timer is reset for 5 minutes session
- All behavior is ignored & Target behavior is record

Attention plus blocking condition *(for Cheri only)*

- Experimenter begins session by saying, “I am going talk to you for 10 (or 5) minutes. If you do _______ (i.e., target behavior) I will stop you”
- Positive social praise is delivered approximately once every 30 s
- Any attempt of engaging in target behavior was blocked through redirecting the participant’s hands back to his or her lap
- Session ends when timer sounds
- Session timer is reset for 5 minutes session
- All behavior is ignored & Target behavior is record
APPENDIX D

SOCIAL VALIDITY QUESTIONNAIRES
SOCIAL VALIDITY LETTER FOR PARENTS

April 9, 2009

Dear Parents

I conducted a study this winter and spring for my PhD Dissertation and included your child in the study. I am gathering my data to begin writing my paper. Here is a questionnaire that will help me to understand what you think about the study. I would greatly appreciate it if you completed the attached questionnaire and sent it back in the enclosed envelope. I have also enclosed a copy of the final report discussing the results that I sent home with your child. Please refer to that to answer the questions. There is no need to send the report back with the questionnaire and please do not put your names on the questionnaire, unless you have any questions and would like me to get back to you. Thank you for your prompt response in advance and thanks again for allowing your child to participate in my study.

Sincerely!

Yi-Chieh Chung, MA
Doctoral Candidate
The Ohio State University
Parents Social Validity Questionnaire

Please refer to the final report regarding your child to answer the following questions. Please circle one response per question. The following questions are used to gather your opinions about the study goals.

Study Goals

1. Automatically maintained behavior (i.e., behavior maintained by engaging in that behavior itself) is often difficult to assess and treat due to the intrinsic reinforcement provided by the behavior. One of the goals of this study was to initially identify whether your child’s stereotypic behavior was automatically maintained. Do you think that it is important to identify what is maintaining of your child’s stereotypic behavior?

<table>
<thead>
<tr>
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<th>Somewhat important</th>
<th>Neutral</th>
<th>Important</th>
<th>Very Important</th>
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<td>4</td>
<td>5</td>
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</tbody>
</table>

2. Another goal of this study was to determine the effects of four different environmental conditions on automatically maintained behavior. Do you think that it is important for children with automatically maintained behavior to be exposed to different environmental conditions that might decrease the behavior in?

<table>
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<tr>
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<th>Neutral</th>
<th>Important</th>
<th>Very Important</th>
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</thead>
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</table>

3. A final goal was to determine for how much time we should provide the environmental condition that would lead to the lowest occurrence of automatically maintained behavior. Do you think that it is important to address how long we should provide the environmental condition?

<table>
<thead>
<tr>
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<th>Somewhat important</th>
<th>Neutral</th>
<th>Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
<td>3</td>
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<td>5</td>
</tr>
</tbody>
</table>
The following questions are used to gather your opinions about the study procedures.

**Study Procedures**

4. In the study, one procedure used to address the above goals was to determine which one of the four environmental conditions led to the lowest occurrence of automatically maintained behavior. Do you think it is practical for your child’s teacher to implement this procedure?

<table>
<thead>
<tr>
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<th>Somewhat practical</th>
<th>Neutral</th>
<th>Practical</th>
<th>Very practical</th>
</tr>
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5. Another procedure was used to determine whether shorter periods (i.e., 10 minutes or 5 minutes) can lead to similar effects as longer periods (i.e., 15 minutes). Do you think it is practical for your child’s teacher to implement this procedure?

<table>
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<tr>
<th>Not practical</th>
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<th>Practical</th>
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6. Would you suggest implementing either of these procedures to parents if they wanted to address goals similar to those above if their child had a similar behavior?

<table>
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<tr>
<th>No</th>
<th>Maybe</th>
<th>Neutral</th>
<th>Yes</th>
<th>Absolutely</th>
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The following questions are used to gather your opinions about the study results. Please refer to figures and description of the results on the final report for details.

**Study Results**

7. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the most effective pre-session environmental condition was provided?

<table>
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<th>Satisfied</th>
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8. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the shorter periods of pre-session environmental condition were provided?

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<th>Satisfied</th>
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<td>4</td>
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9. Please feel free to make additional comments concerning the goals, procedures, and results of the study and your child’s participation.

Your feedback is really appreciated Thank you so much for taking the time to complete this questionnaire.

Yi-Chieh Chung
April 9, 2009

Dear teacher/staff

I conducted a study this winter and spring for my PhD Dissertation and included your child in the study. I am gathering my data to begin writing my paper. Here is a questionnaire that will help me to understand what you think about the study. I would greatly appreciate it if you completed the attached questionnaire and sent it back in the enclosed envelope. I have also enclosed a copy of the final report discussing the results that I sent home with your child. Please refer to that to answer the questions. There is no need to send the report back with the questionnaire and please do not put your names on the questionnaire, unless you have any questions and would like me to get back to you. Thank you for your prompt response in advance and thanks again for allowing your child to participate in my study.

Sincerely!

Yi-Chieh Chung, MA
Doctoral Candidate
The Ohio State University
Teacher/Staff Social Validity Questionnaire

Please refer to the final report regarding your student to answers the following questions. Please circle one response per question. The following questions are used to gather your opinions about the study goals.

Study Goals

1. Automatically maintained behavior (i.e., behavior maintained by engaging in that behavior itself) is often difficult to assess and treat due to the intrinsic reinforcement provided by the behavior. One of the goals of this study was to initially identify whether your child’s stereotypic behavior was automatically reinforced. Do you think that it is important to identify what is maintaining your student’s stereotypic behavior?

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<th>Important</th>
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2. Another goal of this study was to determine the effects of four different environmental conditions on automatically maintained behavior. Do you think that it is important for students with automatically maintained behavior to be exposed to different environmental conditions that might decrease the behavior?

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3. A final goal was to determine for how much time we should provide the environmental condition that would lead to the lowest occurrence of automatically maintained behavior. Do you think that it is important to address how long we should provide the environmental condition?

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The following questions are used to gather your opinions about the study procedures.
**Study Procedures**

4. In the study, one procedure used to address the above goals was to determine which one of the four environmental conditions led to the lowest occurrence of automatically maintained behavior. Do you think this it is practical for you to implement this procedure?

Not practical | Somewhat practical | Neutral | Practical | Very practical
---|---|---|---|---
1 | 2 | 3 | 4 | 5

5. Would you be willing to implement this procedure?

No | Maybe | Neutral | Yes | Absolutely
---|---|---|---|---
1 | 2 | 3 | 4 | 5

6. Another procedure was to determine whether shorter periods (i.e., 10 minutes or 5 minutes) can lead to similar effects as longer periods (i.e., 15 minutes). Do you think this it is practical for you to implement this procedure?

Not practical | Somewhat practical | Neutral | Practical | Very practical
---|---|---|---|---
1 | 2 | 3 | 4 | 5

7. Would you be willing to implement this procedure?

No | Maybe | Neutral | Yes | Completely
---|---|---|---|---
1 | 2 | 3 | 4 | 5

8. Would you suggest implementing either of these procedures to teachers/staffs if they wanted to address goals similar to those above if their students had a similar behavior?

No | Maybe | Neutral | Yes | Completely
---|---|---|---|---
1 | 2 | 3 | 4 | 5

The following questions are used to gather your opinions about the study results. Please refer to figures and description of the results on the final report for details.
**Study Results**

9. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the most effective pre-session environmental condition was provided?

<table>
<thead>
<tr>
<th>Not satisfied</th>
<th>Somewhat satisfied</th>
<th>Neutral</th>
<th>Satisfied</th>
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10. How satisfied were you that the automatically maintained behavior decreased to appropriate levels after the shorter periods of pre-session environmental condition were provided?

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<th>Not satisfied</th>
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<th>Satisfied</th>
<th>Very satisfied</th>
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11. Did your students enjoy participating in the study?

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<th>Not happy</th>
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<th>Happy</th>
<th>Very happy</th>
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12. Please feel free to make additional comments concerning the goals, procedures, and results of the study and your child’s participation.

Your feedback is really appreciated! Thank you so much for taking the time to complete this questionnaire.

Yi-Chieh Chung
APPENDIX E

DISSERTATION RESULTS SUMMARY LETTERS SENT TO PARENTS AND STAFF
April 9, 2009

To the Parents/Guardian of Rosy and XXX School Staff,

My name is Yi-Chieh Chung and I am a doctoral candidate in the Special Education Department of the Ohio State University (OSU). Earlier in the year, I sent home a letter asking for consent to include Rosy in my dissertation study. Rosy was very compliant and delighted when I work with her. I really appreciate her participation. It is now almost the end of the school year, and I have completed my data collection. I would like to provide a final report and share the results with you.

Why Rosy?

I included Rosy in my dissertation because I was searching for students that had automatically maintained behavior (i.e., a behavior maintained by engaging in that behavior itself). Relevant information was gathered based on her teacher’s recommendation and my observation. In Rosy's case, she was found to frequently tap her mouth when she was alone.

What did my study involve?

During all my sessions, I brought Rosy into a small room (the vision room) and we sat at a table. There were three phases of this study. The first phase, a functional analysis, was used to identify whether Rosy’s mouth tapping was automatically maintained.

In Phase 2, I conducted an experiment to determine the effects of four different environmental conditions on mouth tapping behavior (target/challenging behavior). In one condition (i.e., no-interaction condition), no attention was given for the target behavior nor was blocked. In the second condition (i.e., attention condition), attention was delivered every 30 seconds regardless of what behavior was occurring. In the third condition (i.e., blocking condition), no attention was given, but attempts to engage in the challenging behavior were blocked by gently guiding Rosy’s hand(s) back into her lap or placing my hands between her mouth and hand(s). In the final condition (i.e., attention plus blocking), attention was given every 30 seconds and the target behavior was blocked. Based on the results from this phase, I was able to determine which condition resulted in the lowest occurrence of the target behavior.
In Phase 3, I evaluated whether 10 minute and/or 5 minute periods of antecedent events produced effects similar to the 15 minute pre-session conditions.

**What were the results?**

The results of this analysis are shown in Figure 1 on the following page. The highest level of mouth tapping was observed exclusively during the no-interaction condition. The results from the functional analysis suggested that Rosy’s mouth tapping was maintained by engaging in the behavior itself (i.e., the behavior was automatically maintained).

In Phase 2, I conducted an experiment to determine the effects of four different environmental manipulations on the target behavior. The results suggested that providing 15 minutes of free access to the target behavior prior to a session led to the greatest decreases in her tapping behavior. The results from this analysis are shown in Figure 2 on the following page.

Using the information gathered in Phase 2, I then in Phase 3 examined the effects of providing 5 minutes and 10 minutes of free access to mouth tapping. Before the examination, the first data point labeled no pre-session showed the occurrence of target behavior when I did not provide time for Rosy to engage in her mouth tapping. The occurrence of the target behavior was high when free access to the behavior was not provided prior to test conditions. When free access to the behavior was provided, the results suggested that 5 minutes and 10 minutes of free access to mouth tapping led to identical effects with 10 minutes of free access generated relatively stable results. The results from this analysis are shown in Figure 3 on the following page.

Based on my experiences working with Rosy, I recommend that providing free time (i.e., 5 minutes or 10 minutes) for her to engage in mouth tapping decreases her challenging behavior.

I wanted to thank you all for your help and participation and for allowing Rosy to participate in my study. I am four months away from graduating from OSU with my PhD in Special Education and Applied Behavior Analysis. Please feel free to contact me with any questions or concerns.

Sincerely,

Yi-Chieh Chung, MA  
Doctoral Candidate  
The Ohio State University
Figure 3
April 11, 2009

To the Parents/Guardian of Alex and Northeast School Staff,

My name is Yi-Chieh Chung and I am a doctoral candidate in the Special Education program at The Ohio State University (OSU). Earlier in the year, I sent home a letter asking for consent to include Alex in my dissertation study. Alex was always very compliant and delighted when I worked with him. I really appreciate his participation. It is almost the end of the school year, and I have completed my data collection. I would like to provide a final report and share the results with you.

Why Alex?

I included Alex in my dissertation because I was searching for students that had automatically maintained behavior (i.e., a behavior maintained by engaging in that behavior itself). In Alex's case, he was observed to frequently play with string-like objects.

What did my study involve?

During all my sessions, I brought Alex into a small room, and we sat next to each other. A string was provided during all the sessions. There were three phases of this study. The first phase, a functional analysis, was used to confirm that Alex’s string playing was automatically maintained.

In Phase 2, I conduct an experiment to determine the effects of four different environmental conditions on string playing (target behavior). In one condition (i.e., no-interaction), no attention was given for the target behavior nor was it blocked. In the second condition (i.e., attention), attention was delivered every 30 seconds regardless of what behavior was occurring. In the third condition (i.e., blocking), no attention was given, but attempts to engage in the target behavior were blocked by gently guiding Alex’s hand(s) back into his tray or placing my hands between his hand(s) and the string. In the final condition (i.e., attention plus blocking), attention was given every 30 seconds and the target behavior was blocked. Based on the results from this phase, I was able to determine which condition resulted in the lowest occurrence of the target behavior.
In Phase 3, I evaluated whether 10 minute and/or 5 minute periods of antecedent events produced effects similar to the 15 minute pre-session conditions.

What were the results?

The results of Phase 1 are shown in Figure 1 on the following page. The highest level of mouth tapping was observed exclusively during the no-interaction condition. The results from the functional analysis suggested that Alex’s string playing was maintained by engaging in the behavior itself (i.e., the behavior was automatically maintained).

In Phase 2, I conducted an experiment to determine the effects of four different environmental manipulations on the target behavior. The results suggested that providing 15 minutes of free access to the target behavior prior to a session led to the greatest decreases in the target behavior. The results from this analysis are shown in Figure 2 on the following page.

Using the information gathered in Phase 2, I then, in Phase 3, examined the effects of providing 5 minutes and 10 minutes of free access to string playing on the levels of that behavior in a subsequent no interaction condition. Before the examination, there was a data point showing the occurrence of the target behavior when I did not provide time for Alex to engage in string playing. The occurrence was high when free access to the behavior was not provided prior to test conditions. When free access to the behavior was provided, the results suggested that 5 minutes and 10 minutes of free access to string playing led to similar effects.

Based on my experiences working with Alex, I recommend that providing free time (i.e., 5 minutes or 10 minutes) for him to engage mouth tapping decreases the target behavior.

I wanted to thank you all for your help and participation and for allowing Alex to participate in my study. I am four months away from graduating from OSU with my PhD in Special Education and Applied Behavior Analysis. Please feel free to contact me with any questions or concerns.

Sincerely,

Yi-Chieh Chung, MA
Doctoral Candidate
The Ohio State University
Figure 3
April 22, 2009

To the Parents/Guardian of Jane and Northeast School Staff,

My name is Yi-Chieh Chung and I am a doctoral candidate in the Special Education program at The Ohio State University (OSU). Earlier in the year, I sent home a letter asking for consent to include Jane in my dissertation study. Jane was always very compliant and delighted when I worked with her. I really appreciate her participation. It is almost the end of the school year, and I have completed my data collection. I would like to provide a final report and share the results with you.

Why Jane?

I included Jane in my dissertation because I was searching for students that had automatically maintained behavior (i.e., a behavior maintained by engaging in that behavior itself). In Jane's case, she was observed to frequently putting an object or her hand into her mouth.

What did my study involve?

During all of my sessions, the “chewy” was always with her as you requested. For all those sessions, I brought Jane into a small room (the vision room) and we sat at a table. There were three phases of this study. The first phase, a functional analysis, was used to confirm that Jane’s hand/object mouthing was automatically maintained.

In Phase 2, I conducted an experiment to determine the effects of four different environmental conditions on hand/object mouthing (target behavior). In one condition (i.e., no-interaction), no attention was given for the target behavior nor was it blocked. In the second condition (i.e., attention), attention was delivered every 30 seconds regardless of what behavior was occurring. In the third condition (i.e., blocking), no attention was given, but attempts to engage in the target behavior were blocked by gently guiding Jane’s hand(s) back into her lap or placing my hands between her mouth and hand(s). In the final condition (i.e., attention plus blocking), attention was given every 30 seconds and the target behavior was blocked. Based on the results from this phase, I was able to determine which condition resulted in the lowest occurrence of the target behavior.
In Phase 3, I evaluated whether 10 minute and/or 5 minute periods of antecedent events produced effects similar to the 15 minute pre-session conditions.

**What were the results?**

The results of Phase 1 are shown in Figure 1 on the following page. The highest level of hand/object mouthing was observed during the no-interaction condition. The results from the functional analysis suggested that Jane’s hand/object mouthing was maintained by engaging in the behavior itself (i.e., the behavior was automatically maintained).

In Phase 2, I conducted an experiment to determine the effects of four different environmental manipulations on the target behavior. The results suggested that providing 15 minutes of response blocking (i.e., gently redirecting her hands to her lap or placing my hands between her mouth and an object or her hands) prior to a session led to the greatest decreases in her hand/object mouthing behavior. The results from this analysis are shown in Figure 2 on the following page.

Using the information gathered in Phase 2, I then in Phase 3 examined the effects of providing 5 minutes and 10 minutes of free access to hand/object mouthing on the level of that behavior in a subsequent no interaction condition. Before the examination, the first data point showed the occurrence of the target behavior when I did not block her hand/object mouthing. The occurrence was high when response blocking was not provided prior to test conditions. When the response blocking of the target behavior was provided, the results suggested that 10 minutes of response blocking led to more consistent and positive effects.

Based on my experiences working with Jane, gently redirecting her hand(s) to her lap or placing your hands between her mouth and an object or her hand(s) for 10 minutes can lead to little or no occurrence of hand/object mouthing behavior.

I wanted to thank you all for your help and participation and for allowing Jane to participate in my study. I am four months away from graduating from OSU with my PhD in Special Education and Applied Behavior Analysis. Please feel free to contact me with any questions or concerns.

Sincerely,

Yi-Chieh Chung, MA  
Doctoral Candidate  
The Ohio State University
April 9, 2009

To the Parents/Guardian of Cheri and Northeast School Staff,

My name is Yi-Chieh Chung and I am a doctoral candidate in the Special Education program at The Ohio State University (OSU). Earlier in the year, I sent home a letter asking for consent to include Cheri in my dissertation study. Cheri was always very compliant and delighted when I worked with her. I really appreciate her participation. It is almost the end of the school year, and I have completed my data collection. I would like to provide a final report and share the results with you.

Why Cheri?

I included Cheri in my dissertation because I was searching for students that had automatically maintained behavior (i.e., a behavior maintained by engaging in that behavior itself). Relevant information was gathered based on her teacher’s recommendation and my observation. In Cheri’s case, she was found to frequently twist her shirt and place hand(s) in front of her face (target behavior).

What did my study involve?

During all of my sessions, I brought Cheri into a small room (the vision room) and we sat at a table. There were three phases of this study. The first phase, a functional analysis, was used to confirm that Cheri’s target behavior was automatically maintained.

In Phase 2, I conducted an experiment to determine the effects of four different environmental conditions on the target behavior. In one condition (i.e., no-interaction), no attention was given for the target behavior nor was it blocked. In the second condition (i.e., attention), attention was delivered every 30 seconds regardless of what behavior was occurring. In the third condition (i.e., blocking), no attention was given, but attempts to engage in the target behavior were blocked by gently guiding Cheri’s hand(s) back into her lap. In the final condition (i.e., attention plus blocking), attention was given every 30 seconds and the target behavior was blocked. Based on the results from this phase, I was able to determine which condition resulted in the lowest occurrence of the target behavior.
In Phase 3, I evaluated whether 10 minute and/or 5 minute periods of antecedent events produced effects similar to the 15 minute pre-session conditions.

**What were the results?**

The results of Phase 1 are shown in Figure 1 on the following page. The highest level of mouth tapping was observed exclusively during the no-interaction condition. The results from the functional analysis suggested that the behavior of twisting shirt and placing hand(s) in front of the face (target behavior) was maintained by engaging in that behavior itself (i.e., the behavior was automatically maintained).

In Phase 2, I conducted an experiment to determine the effects of four different environmental manipulations on the target behavior. The results suggested that providing 15 minutes of attention plus blocking prior to a session led to the greatest decreases in the target behavior. The results from this analysis are shown in Figure 2 on the following page.

Using the information gathered in Phase 2, I then, in Phase 3, examined the effects of providing 5 minutes and 10 minutes of free access to mouth tapping on the levels of mouth tapping in a subsequent no interaction condition. Before the examination, there was a data point showing the occurrence of the target behavior when I did not provide attention plus blocking. The occurrence was high when attention plus blocking was not provided prior to test condition. When attention plus blocking was provided, the results suggested that 5 minutes and 10 minutes of attention plus blocking led to similar effects.

Based on my experiences working with Cheri, I recommend that providing positive comments every 30s and blocking the target behavior in the form of gently guiding Cheri’s hand(s) back into her lap (for 5 minutes or 10 minutes) decreases the target behavior.

I wanted to thank you all for your help and participation and for allowing Cheri to participate in my study. I am four months away from graduating from OSU with my PhD in Special Education and Applied Behavior Analysis. Please feel free to contact me with any questions or concerns.

Sincerely,

Yi-Chieh Chung, MA
Doctoral Candidate
The Ohio State University