near zero levels of the behavior when implemented for thumb sucking and then hair pulling. Next, hair pulling was treated with the same procedures, which resulted in near zero levels of the behavior. Thus, treatment of thumb sucking might not result in the elimination of covarying hair pulling in all children.

In a similar study, Long et al. (1999) examined whether a SHR procedure would eliminate thumb sucking in individuals with mild to moderate mental retardation. Although the SHR did little to decrease the finger/hand-to-mouth behavior, the addition of remote contingencies decreased the habit to near-zero levels for both participants who exhibited these target behaviors. These authors suggested that a limitation of SHR in persons with mental retardation might be the lack of reinforcement or negative social consequences. Even though all participants learned the necessary skills to control their habit, there were no reinforcement contingencies in place in their natural environment to maintain the use of their skills. Also, persons with severe mental retardation may be less responsive to the negative social consequences that result from engaging in their habit behaviors. Perhaps what facilitates the independent use of SHR is the experience of negative social consequences. Thus, for some individuals who do not experience negative social consequences, an additional motivational system based on external reinforcers may be a necessary adjunct to SHR.

3.1.4 Other Behavior Change Procedures

In addition to reinforcement, punishment, and habit reversal treatments, a number of other interventions have also been used to treat thumb sucking. Dentists have advocated the use of a variety of response prevention methods, including oral devices and a palatal crib with spurs so that insertion of the thumb into the mouth produces a painful sensation. Fortunately, the use of a simple removable orthodontic appliance in the upper arch, which prevents contact between the digit and the roof of the mouth, has been shown to eliminate thumb sucking. Campbell-Reid and Price (1984) reported that persistent finger sucking in four of five subjects stopped within six months of treatment with the insertion of a dental appliance.

Ellingson et al. (2000) reported that application of adhesive bandages to the fingers, which diminished tactile stimulation, resulted in a decrease of finger sucking in one child and cessation of finger sucking in another child. Gloves were then assessed in both children, based on the implication that
oral stimulation, digital stimulation, or both were maintaining finger sucking. Gloves were chosen in place of adhesive bandages because they were reusable and did not leave residue on the fingers. No finger sucking was noticed in one child during 20 of the 22 checks. Both the child and the mother agreed that the treatment was acceptable.

An awareness enhancement device (AED: Rapp, Miltenberger, & Long, 1998) was implemented into the treatment of the other child, due to the fact that only moderate decreases in finger sucking were observed during the use of gloves. The AED emitted a 65 to 70 dB tone dependent upon placement of the child’s hands within 6 inches of her head and did not cease until the hand was lowered from the head. Employment of the AED resulted in suppression of finger sucking for nine sessions (M = 0%); however, finger sucking increased slightly after withdrawal of the AED 10 sessions later (M = 1.3%). Reimplementation of the AED phase resulted in near-zero levels of finger sucking (M = 0.2%) for 12 sessions. Both the child and the mother agreed both the glove and AED treatments were acceptable, however, the child preferred the AED (Ellingson et al., 2000).

In an earlier study, Friman (1988) treated a child who chronically sucked her thumb while holding a doll, by placing the doll out of her reach. During treatment, when the child asked her parents about the doll, she was told that she had outgrown her need for it and that she should seek out other objects to play with. During the withdrawal phase, the doll was placed on the child’s bed and nothing was said about its return. In the third, and final withdrawal session, after the child had sucked her thumb for an extended period of time, the child angrily told her parents not to leave the doll on her bed because it made her suck her thumb. Three and six month follow-up observations were similar to the treatment conditions in that the doll was placed out of the child’s reach. Thumb sucking was eliminated with treatment and the elimination was maintained across follow-up sessions.

4. **CONCLUDING COMMENTS**

The good news for the clinician is that there are a number of highly successful treatments available for the reduction and elimination of nail biting and thumb sucking. However, long-term reduction and elimination of these habits seem to be achieved less often than reductions in the short-run. This suggests some directions for future research. First, a better understanding of the variables controlling these behaviors would facilitate
development of improved treatments or treatments better targeted at the factors maintaining the behaviors in a given individual. It would be important to understand whether tension reduction, self stimulation, or some form of social reinforcement is involved in the maintenance of oral-digital habits in order to better treat these behaviors. Conducting functional analyses of these behaviors would aid in this process.

Although habit reversal continues to be studied actively, the components of the treatment responsible for behavior change remain unclear. Is self-monitoring, a competing response, social reinforcement or some other element crucial to the treatment’s efficacy? There are still no studies on the role of the expectancy of treatment benefit in these literatures, despite Azrin et al.’s (1980a) suggestion of its importance. In fact, it remains to be determined whether the success of any treatment utilized to date is based on anything more than the influence of nonspecific factors. In addition, too few studies have examined the social validity and generalization of treatments and the effects on other behaviors, including other habit behaviors. Finally, work applying habit reversal to mentally retarded individuals suggests the further study of individual difference and environmental variables would be profitable.

The assessment of nail biting and thumb sucking has been excessively reliant on self-reports by participants. Miltenberger, Fuqua, and Woods (1998) reviewed a number of innovative assessment strategies that are less reliant on client self-reports. These include videotaping clients in high risk situations in the natural environment and monitoring the target behavior by significant others in the client’s life. Assessment of a variety of aspects of the target behavior and client reactions should become standard practice in evaluating treatments for these behaviors.

5. REFERENCES


Chapter 12

Habit Reversal Treatment Manual for Oral-Digital Habits

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1. INTRODUCTION

This chapter provides a treatment manual for oral-digital habits in children, adolescents, and adults. Oral-digital habits include thumb and finger sucking, fingernail biting, and biting skin around the fingernails. The treatment described in this chapter is based on the habit reversal procedure outlined by Azrin and Nunn (1973). There is substantial evidence habit reversal is an effective therapy for oral-digital habits in typically developing persons, although its effectiveness in treating persons with developmental disabilities is less clear (Miltenberger, Fuqua, Woods, 1998).

2. HABIT REVERSAL TREATMENT PROTOCOL FOR ORAL-DIGITAL HABITS

As outlined in this protocol, implementation of habit reversal for oral-digital habits requires a minimum of four sessions. During the first one-hour session the clinician conducts an interview, administers standardized assessments, and establishes a system for data collection.

During the second one-hour session, habit reversal is implemented. Habit reversal includes awareness training, competing response training, and social support training. The third and fourth sessions are booster sessions whose
The purpose is to monitor progress, review treatment implementation, and develop solutions to problems that may have occurred since the previous session. Each booster session lasts approximately 30 minutes.

2.1 Session 1

During Session 1 the clinician should gain an understanding of the client's habit and assess for possible functions and comorbid conditions. This is accomplished through an initial interview in which the habit and the possible maintaining variables for the habit are identified, and sensory experiences surrounding the habit are discussed. Next, standardized assessments for comorbid problems are conducted. Finally, an ongoing assessment plan should be established and continued throughout treatment to monitor effectiveness.

2.1.1 Identifying the Habit

The interview should begin by having the client work with the clinician to define the behavior until both are clear about what is being targeted. Additionally, a definition will be needed for data collection purposes. The clinician should record the definition, for it will be needed later in treatment.

2.1.2 Identifying Possible Functions

After the habit has been defined, the clinician should determine any possible variables maintaining the habit, including any socially mediated environmental variables. Determining the maintaining variables can often be done through a functional assessment interview (see Chapter 2 for assessment procedures), and is important because the course of treatment may differ depending on the function of the habit (see Chapter 11 for alternate treatments). For example, if a client's habit is maintained through parental attention, the clinician may forgo habit reversal in exchange for a differential reinforcement of alternative behavior procedure in which attention is provided for a non-habit behavior and withheld contingent on the habit.

In general, three primary variables may maintain oral-digital habits; socially mediated positive reinforcement, socially mediated negative reinforcement, or automatic reinforcement. Although these reinforcers will
be briefly described in this section, Chapter 2 provides a more thorough coverage.

Oral-digital habits will likely draw a reaction from those nearby. To some, this reaction will serve as a positive reinforcer that maintains the habit's occurrence over time. For example a child who sucks his or her thumb will likely draw attention from his or her parents in the form of reprimands, consolation, or other attempts to stop the habit. If a functional assessment interview suggests the behavior is maintained by attention, treatment may involve teaching the parents to respond differently to their child's thumb sucking.

It is also possible that the oral-digital habit alleviates something aversive to the client. In this case, engaging in the habit may result in negative reinforcement. For example, assume we have an adolescent with social anxiety and a thumb sucking habit. When this adolescent sucks his thumb, peers may avoid him or her, which keeps potentially aversive social contact at a distance. In this case, habit reversal may not be needed and therapy would consist of training those in contact with the client to withhold reinforcement for his habit (i.e., reinforcing peers for social interaction with the client in the presence of thumb sucking) or training the client to deal with the underlying anxiety.

Although some habits may be maintained by socially mediated consequences, most seem to occur in the absence of such stimuli. These habits are believed to be maintained by automatic reinforcement. Unfortunately, to say a habit is maintained by automatic reinforcement reveals little about the specific reinforcer maintaining the behavior. Even in cases where the client can report the function of the habit, behaviors maintained by automatic reinforcement are often best treated with an approach such as habit reversal, because "automatic" variables are often outside the control of the clinician or any other external agent of change. To assist in determining habit function, it is sometimes useful to interview the client about sensory experiences surrounding his or her habit.

2.1.3 Sensory Experiences Surrounding Habits

During this phase of the initial assessment the clinician and the client identify bodily sensations or behaviors the client experiences before, during, and after the habit because (1) such behaviors or sensations often point to possible functions and (2) the antecedent behaviors or sensations may be used later in treatment as warnings to engage in the competing response. For
example, sensations that precede fingernail biting could include anxiety or a feeling of "need" to bite the nails. This urge could then be used to prompt the client to become more aware of the habit occurrence which is a key factor to the awareness training procedures described in Session 2.

Likewise, the feelings experienced during and after the habit may provide useful information as to the function the habit serves. For example, if the client reports a feeling of "relief" during or after the habit, it may be presumed that the habit is being maintained by automatic negative reinforcement.

2.1.4 Behavioral Observation and Setting up Ongoing Data Collection

After the sensory experiences surrounding the habit are identified, a method of data collection should be implemented at home and in the clinic. Data collection procedures are used for monitoring treatment effectiveness and to determine the necessity of procedural modifications. Data collection should ideally be implemented in situations where the habit is most likely to occur. Often, this is in the home. Clinic-based data collection should occur only for reliability and as a back-up if data collection procedures established elsewhere fail. In the following paragraphs, home-based and clinic-based methods for data collection will be discussed.

2.1.4.1 Home-based Methods

As stated earlier, data should be collected on the rate of occurrence of the target behavior. Video recording is an excellent form of data collection, although many individuals may not feel comfortable being videotaped and may intentionally not engage in the habit. If video monitoring is acceptable to the client, the clinician should teach the client, a caregiver, or significant other how to videotape.

The caregiver or significant other should collect frequent (e.g. 2-3 times per week) 10-20 minute video segments of the client. The segments can then be returned to the clinician and scored using a duration or partial interval scoring method (Barlow & Hersen, 1984).

If video monitoring is not a viable option, self-monitoring or parent-monitoring (if client is a child) may be utilized. When using self-monitoring, the client could be given a number of cards on which the date is printed on the front and the clinician’s phone number is printed on the back.
The client can be asked to carry the card with him or her at all times and mark the card each time the habit occurs. If continuous monitoring is too difficult, clients may collect data on the occurrence of the habit for a predetermined shorter period at the same time each day (e.g., 1:00pm-3:00pm). Parent monitoring can be done in a similar fashion with parents counting the frequency of the habit during a given time period. At the end of each day, the client should call or e-mail the therapist and state the number of times the habit occurred. Daily client reports are recommended to increase compliance with data collection and to enhance motivation for treatment.

2.1.4.2 In-Clinic Methods

Clinic-based data collection methods could be implemented in a number of ways. The suggested procedure is video recording, similar to that described in the previous section. Another clinic-based assessment measure involves photographing the client's hands throughout sessions and comparing the photographs on the amount of visible damage.

2.1.5 Standardized Assessments of Other Conditions

After all other components of Session 1 are completed the clinician should assess for the presence of any comorbid psychological conditions. A growing body of literature suggests those with habitual behaviors, or stereotypic movement disorder, are more likely to have comorbid psychological conditions such as ADHD, depression, and anxiety than those without habitual behaviors (Teng, Woods, & Twohig, 2000). Although assessment strategies and particular treatments for such comorbid conditions are outside the scope of this book, the clinician should attempt to determine the presence of these conditions and modify treatment accordingly.

At the end of Session 1, the clinician should ask the client to identify a support person to bring with him or her during the next session. The support person will be needed for implementing a part of the treatment known as social support training. This could be introduced to the participant as follows.

"There is a part of the treatment in which we teach a person close to you to help you with treatment outside of the therapy session. Can you think of a person who would be willing to help you with treatment?"
2.2 Session 2

Prior to initiating treatment, the clinician and client should review the data collected thus far. The clinician should praise the client for collecting the data, which may then be used as a basis for comparing subsequent data to determine treatment effectiveness. After praising the client and reviewing the data, treatment should begin.

The goal of Session 2 is to implement habit reversal. As a therapy for oral-digital habits, habit reversal includes three main components: awareness training, competing response training, and social support. The purpose of awareness training is to help the individual recognize the habit and somatic sensations or behaviors that precede the habit (referred to as “warning signs” throughout the chapter). After the client is able to recognize the habit and the warning signs, he or she is taught to use a competing response contingent on the habit and warning signs. A competing response is any behavior that makes it difficult to engage in the habit. After the client demonstrates an ability to recognize his or her warning signs, and can perform a competing response contingent upon them, he or she is asked to gain the assistance of someone in implementing the procedure. This is known as social support and involves having someone close to the client assist the client in using the competing response contingent on the habit or warning signs.

2.2.1 Awareness Training

The goal of awareness training is to teach the client to recognize his or her habit and warning signs. Self-awareness is deemed essential because habit reversal is essentially a self-management procedure that requires clients to implement the competing response contingent on the occurrence of these events.

Awareness training is accomplished by helping the client isolate and acknowledge the warning signs that occur just prior to the habit and by helping the client recognize instances of the actual habit. Awareness is achieved through the use of two techniques: response description and response detection.
2.2.1.1 Response Description

Response description involves providing a description of the target behavior and warning signs. However, before starting response description, a rationale for awareness training should be given. An example of such a rationale is as follows.

"The very first thing we are going to do today is figure out just what your habit is like, and what happens just before you do your habit. After we know exactly what your habit is, we will do some exercises to help you become more aware of when it is going to happen. This is very important because if you want to learn to manage something you must first know when it is happening."

After providing the rationale for awareness training, the clinician should ask the client to describe his or her habit. Although this was done to a certain extent during Session 1, the process of describing the behavior in Session 2 should involve more detail. Let us use an individual with a fingernail biting habit as an example. For this individual the definition of the habit may be, "when any finger passes the lips and the teeth press down on the nail." Below is an example of how the clinician would ask the client to describe the habit.

"Before we begin helping you with your habit we must come up with a clear definition of what your habit is. This is important in treatment for two reasons. First, in order to become aware of your habit you need to know exactly what the habit entails. Second, it is important that I know exactly what your habit is for effective treatment and communication between the two of us. I would like you to do is describe to me in detail, your habit."

(Clinician allows the client to answer)

"You did not mention which nails you bite. Do you bite all of your nails?"

(Clinician allows the client to answer)

"Nice job describing the habit, I feel we both have a clear understanding exactly what your habit entails."

The clinician should continue to ask questions about the habit until he or she feels the client has provided an accurate description. Because criteria do not exist to determine if the description is accurate, the clinician must rely on his or her judgment. At this point in treatment, the clinician and the client should have a clear description of the habit. If this is not the case, the
clinician and the client should continue to describe the habit until the behavior is clearly described.

After the habit has been fully described, the client should describe his or her warning signs. An example of how this phase of the treatment could be introduced is as follows.

"Next, I want you to describe any feelings or other things you do or experience before your habit. It is very likely that you have certain feelings or do certain things prior to your habit and if we can figure out what these are then you will be more likely to predict when you will do the habit and thus have a better chance of successfully treating your habit. Could you please tell me any feelings or things you do prior to the habit."

Individuals with oral-digital habits may present with a number of warning signs. People with a fingernail biting habit may rub their fingers together or rub their lips with their fingers prior to biting their nails. Likewise, these individuals may experience feelings of anxiety prior to biting or report an urge to bite their nails. As is evident, warning signs for a person’s habit may be both private and public. Regardless, it is vital to the success of habit reversal that the person be able to state the covert or overt behaviors that occur prior to their habit. If the client reports he or she does not have any warning signs, the clinician should point out a few obvious behaviors that could occur. After determining the warning signs, response detection should be implemented.

2.2.1.2 Response Detection

The purpose of response detection is to help the client acknowledge actual occurrences of the habit and its warning signs. This is accomplished in two steps. First, the client should acknowledge clinician simulations of the client’s habit. The client should be made aware of the rationale for this procedure. A sample explanation is as follows.

"We are going to help you continue to become more aware of your habit by having you acknowledge each time I simulate your habit. I would like you to say, “there’s one” or raise your hand each time I simulate your habit. We do this because watching someone else do something is an effective way of becoming aware of your own behaviors. During the next few minutes I will be acting out your habit and would like you to inform me each time I do it.”
This process continues until the client acknowledges four of five clinician-simulated habits. Each time the client acknowledges a simulated habit, the clinician should provide praise. In instances where the clinician simulates a habit, but the client does not acknowledge it, the clinician should state that a habit had occurred and remind the client of the instructions.

After the client has correctly acknowledged simulated occurrences of the habit, the clinician should repeat the process with the client’s warning signs. This involves having the clinician simulate the overt warning signs, and having the client acknowledge each simulation via raising his or her hand or saying “there’s one.” Each warning sign does not need to be presented in separate simulation sessions, but rather presented randomly in one session until the client recognizes four of five clinician-simulated warning signs. This could be introduced as follows.

“Good job at identifying your habit, now I would like to do the same thing with your warning signs.” I am going to simulate the different warning signs that you reported, and each time I do one I would like you to raise your hand or say, “there’s one.” Do you remember what they are? If not, I can remind you. It is important for you to be able to recognize the warning signs for they are the best indicator that your habit is about to occur. If you don’t have any questions, let’s begin.”

After the client has successfully acknowledged four of five clinician simulated habits and warning signs, the second step of response detection should be implemented; acknowledging client-simulated habits in session.

This phase of response detection is similar to the previous one, except the client is asked to acknowledge occurrences of his or her own habits and warning signs. The clinician should instruct the client to acknowledge each time a warning sign or actual habit occurs. It is best if the client can practice by acknowledging actual occurrences, but because the client is in a therapy session, it is unlikely many actual occurrences of the habit will occur. Hence, the client may need to simulate the habit and the warning signs just as the clinician did earlier in the session.

First, the clinician should ask the client to simulate the habit, and after each simulation, tell the clinician it occurred by raising his or her hand or saying, “that’s one.” After the client successfully simulates and acknowledges four of five habits, the process should be repeated with the warning signs. This is done to help the client become more aware of his or her own habit and warning signs. The procedure can be introduced to the client as follows.
"You did a very good job at pointing out my examples of your habit. Now, I would like you to simulate your own habit and point out to me each time you do your habit by raising your hand or saying, "there's one."

Again, the clinician should provide praise for proper simulation and acknowledgement, and corrective feedback for failed acknowledgements of habits. This procedure should continue until the client can successfully acknowledge four of five simulated habits. After this has been successfully completed, the clinician should ask the client to repeat the procedure, but this time simulating the various warning signs. If the client does not remember all of the warning signs the clinician should remind him or her. This could be introduced in the following manner.

"You did a good job demonstrating and acknowledging your habit. Now I would like you to use the same procedure with the warning signs for your habit. Over the next few minutes I would like you to demonstrate the different warning signs we talked about earlier, and after demonstrating each one I would like you to signal or tell me that you just did one. If you do not remember all the warning signs tell me, and I can remind you. If you are ready, you may begin."

At this point, the client will have completed awareness training. The client should now be able to better recognize occurrences of his or her warning signs and habits. Next, the clinician should implement competing response training.

2.2.2 Competing Response Training

Competing response training involves teaching the client to engage in a behavior that is incompatible with the habit, contingent on the occurrence of the habit or one of the warning signs. The competing response is believed to be essential to the effectiveness of habit reversal (Woods, Miltenberger, & Lumley, 1996)

The competing response phase contains four main components: choosing a competing response, demonstrating the correct use of the competing response, teaching the client to use the competing response, and having the client demonstrate the proper use of the competing response.
2.2.2.1 Choosing the Competing Response

A competing response is any behavior which makes it difficult to engage in the habit. The client and clinician should seek a competing response that is effective, acceptable to the client, and generally socially acceptable. Although the clinician can suggest or lead the client toward a certain competing response, the clinician should ultimately let the client choose.

There are many possible competing responses when treating oral-digital habits. However, the clinician and client must come up with one that will not draw attention, be too difficult, or be embarrassing for the client in a given situation. Forcing the client to use a competing response he or she dislikes may decrease treatment compliance. An example of an unacceptable competing response for finger sucking would be having the client sit on his or her hands. Although this may seem like an acceptable alternative because such a behavior would make it impossible for the person to suck his or her fingers, sitting on one’s hands may actually be very noticeable and difficult to do in certain situations. For example sitting on one’s hands during a family dinner may be very noticeable and intruding. A more acceptable competing response may involve having the client subtly clench his or her fists. This behavior would make it difficult for the client to suck his or her fingers and would be more socially appropriate. The following paragraph contains an example of how to introduce and choose an acceptable competing response for the client.

"The next part of treatment involves you finding a different behavior to do for one minute instead of your habit. I will help you select an appropriate alternate behavior. We will call this your competing response. A competing response should make it impossible for you to do your habit. Likewise, your competing response should be something you are comfortable doing. Do you have any ideas for a behavior you would be comfortable doing and would prevent you from doing your habit?"

(Clinician allows the client to answer)

"Yes, crossing your arms is a good idea. But I wonder if it might draw attention to you if you do it often. Perhaps something more discrete would be less noticeable to others."

(Clinician allows the client to answer)

"That sounds like a good idea. Many people choose making fists as their competing response because it is not very noticeable, and easy when you are in a crowd of people. At first, you will probably have to do this many times a day, so do you
To maximize the flexibility of treatment, it is sometimes useful to identify a variety of competing responses appropriate for different situations. For example, when talking with friends at work, putting one's hands in one's pockets for 1 min would be socially acceptable, whereas making a fist may be more noticeable. In this social situation, the clinician and client may agree that putting the hands in the pocket would be a better competing response, whereas subtly making a fist may be more appropriate when in a more reserved social setting (e.g., in class or during dinner).

After the clinician and the client have identified and agreed upon appropriate competing response(s), the implementation of the competing response should begin.

2.2.2.2 Clinician Simulation of the Competing Response

After selecting a competing response, the clinician should demonstrate its correct use. The clinician should simulate the habit, stop, then perform the competing response for one minute. After properly demonstrating the competing response, the clinician should help the client understand how to use the competing response contingent on the occurrence of the habit. This could be introduced as follows.

"Great, now that you have selected a competing response I want to make sure you know how to use it properly. The competing response should be used for one minute each time you start doing the habit or when one of the warning signs occurs. The reason you use a competing response is to give you something to do instead of your habit. After you use the competing response enough you should learn to undo the habit. In the same way you learned to do the habit, you can learn not to do the habit. Now, I am going to demonstrate how to properly use your competing response contingent on the habit."

After the clinician demonstrates the proper use of the competing response and believes the client understands how to correctly use it, he or she can have the client practice the procedure.
2.2.2.3 Teaching the Client the Competing Response

During competing response training the client should demonstrate the proper use of the competing response contingent on the occurrence of his or her habit. The clinician should ask the client to start doing the habit, stop, and perform the competing response for one minute. The clinician should have the client do this until it is done correctly on four of five trials. This can be introduced as follows.

"Now that you’ve seen me correctly use the competing response, I would like you to do it. I would like you to start doing the habit, stop, and perform the competing response for one minute. If you don’t have any questions, you can start at any time."

After the client has demonstrated the correct use of the competing response contingent on the habit four of five times, the clinician should teach the client to use the competing response contingent on the warning signs. This is taught in a similar fashion and can be introduced as follows.

"Good job using the competing response. Now I want to show you how to use it when one of the warning signs occurs. It is done in exactly the same way, except, when one of the warning signs occurs you should perform the competing response. If you do not remember what the warning signs are I can remind you. I will demonstrate how to do this contingent on your warning signs."

The clinician should start doing one of the warning signs, stop, and do the competing response for one minute. Obviously, the clinician cannot simulate the client’s private warning signs, so only the overt signs will be practiced in session. If there are multiple warning signs the clinician should alternate between them rather than teaching the procedure with only one warning sign. After the clinician feels the client understands how to use the competing response contingent on the warning signs he or she should have the client to practice.

"I would like you to use the competing response after your warning signs. I want you to start doing one of the warning signs, stop yourself, and do the competing response for one minute. If you do not remember what the warning signs are I can tell you. If you don’t have any questions, you many begin."

The clinician should ask the client to start doing one of the warning signs, stop and engage in the competing response for one minute. Each time the client engages in the competing response he or she should point it out to the
clinician by saying, "that's one." If the client engages in one of the warning signs without doing the competing response, the clinician should acknowledge this by saying something like, "you just rubbed your fingers together, don't forget to use the competing response."

The client should continue until he or she has successfully used the competing response contingent on the warning signs four of five times. At this point, the client should have demonstrated the correct use of the competing response contingent on the actual habit and the warning signs. The clinician should instruct the client to use the competing response for one minute when the client does either a warning sign or the actual habit. The client must understand this is crucial to the success of treatment, and that he or she must continue to implement the competing response outside of session throughout the course of treatment. These instructions could be presented in the following fashion.

"It is very good to see that you know how to use the competing response correctly. I want you to use this every time you experience one of the warning signs or do the actual habit. When you go home you must continue to implement the competing response correctly. This will continue until we have completed treatment. If you have no further questions, I am now going to give you a way to help you remember to do the competing response."

2.2.3 Social Support Training

The purpose of the social support phase is to increase treatment compliance. Social support training involves identifying a person to help the client remember to use the competing response. If the support person views the client doing the habit and not using the competing response, he or she should to remind the client to use it, and conversely, the support person should praise the client for correctly using the competing response. The social support procedure involves identifying and training the support person.

2.2.3.1 Identifying the Support Person

Many different circumstances affect who should be selected as the social support person. In the case of a child, the person would ideally be a parent. If the client is in a relationship, it would most likely be the significant other. Likewise, if a person shares a living space with another person, the
roommate may be ideal. In the case where the person does not live with anyone and is not in a relationship, the clinician should ask the client to nominate a person willing to help with his or her treatment. Ideally the support person should be at Session 2, thus the idea of the support person should have been discussed during the first session.

2.2.3.2 Training the Social Support Person

At this point in Session 2, the clinician should invite the support person into the room. If the social support person is unavailable, the clinician should teach the client what to teach the support person. The basic idea of the intervention and the role of the support person should be explained as follows.

"Thank you for agreeing to help (the client) with the treatment. Your basic role is to help (the client) remember to use the exercise she has been taught. First I would like to tell you what (the client) has done so far. Before (the client) does her habit she will almost always do one of a number of warning signs, so (the client) and I did some exercises to help her recognize each time she does one of those signs. Now every time she catches herself doing one of the signs she is supposed to make fists with her hands. She makes fists with her hands because that makes it difficult for her to bite her fingernails. If she can keep making the fists instead, her habit will eventually go away.

What I would like you to do is praise her when you see her making her fists, and remind her to make the fists every time you see her biting her fingernails."

At this point, the clinician should demonstrate the warning signs and teach the support person to correctly praise the use of the competing response. The support person should deliver praise in a way that is most comfortable to him or her. This is practiced by having the client properly use the competing response, then having the social support person praise him or her. This could be introduced as follows.

"When you two leave the clinic, I would like you (social support person) to praise her for correct use of the procedure. You don’t have to do anything special, just praise her as you would naturally. I will demonstrate it one time, so you get the idea."

The clinician should ask the client to demonstrate the correct use of the competing response and the clinician should then praise him or her. After correctly praising the use of the competing response, the clinician should have the support person practice delivering the praise. The clinician should
have the client demonstrate the correct use of the competing response, but this time the support person should praise the client. This could be introduced as follows.

“Okay, you saw me praise (the client) for the proper use of the competing response. Now, I would like you to do the same thing. I’ll ask her to demonstrate the proper use of the competing response and I would like you to praise her. Whenever you are ready (client), you may demonstrate the competing response and I would like you (social support person) to praise her. Please use praise that is comfortable to you.”

After the support person has demonstrated the ability to praise the correct use of the correct competing response, the clinician should teach the support person to properly remind the client when the habit occurs. In this part of treatment, the client should perform the habit without using the competing response, and the clinician should demonstrate the correct way to prompt the client. The clinician should remind the client by saying something like, “don’t forget to use your competing response when you do your habit.” This could be introduced as follows.

“Good job praising the correct use of the competing response (social support person). Now, I would like to demonstrate what you should do if you see (client) biting her fingernails, but not using the competing response.”

At this point the client and support person should understand how the social support process works. The next phase is to have the support person demonstrate reminding the client. The clinician should ask the client to demonstrate the habit but not the competing response and have the support person remind him or her to use the competing response. This could be introduced by saying something such as...

“Now I would like you to practice reminding her when she does not use it. Please (client), perform your habit but do not use the competing response, and (support person) demonstrate reminding her. Whenever you are ready, I would like you to perform your habit.”

The clinician should provide praise to the support person for a correct prompt, and provide corrective feedback if needed. The support person should be able to properly praise the correct use of the competing response and prompt the client when he or she is seen performing the habit but not using the competing response.
Finally, the clinician should ask the support person to continue the praise and prompt strategy for the remainder of treatment. The clinician should ask the client and support person if there are any questions about the treatment. If there are no questions, the clinician may excuse the client and support person.

2.3 Sessions 3 and 4

Booster sessions should occur at one and two weeks after Session 2. The purpose of Sessions 3 and 4 is to review the data, troubleshoot any problems that may have arisen, and to review the treatment.

When reviewing the data, the clinician should look for evidence of treatment effectiveness and any trends in the behavior that could be explained by environmental events. An example of such a trend could be one in which the client shows consistent increases in the target behavior during the middle of the week. If this trend is consistent throughout time, it is likely that an environmental event is exacerbating the biting at this time. In such cases, the clinician should try to isolate and alter such variables.

Second, the clinician should ask about any concerns with the procedure. The clinician should help solve these problems. An example of a problem could be that the client only uses the competing response when in the presence of the support person, or the client engages in the habit while he or she is sleeping. Possible solutions to these problems are included in the section on ancillary procedures and concerns.

Finally, the treatment should be reviewed. The review begins by asking the client the warning signs identified in Session 2. If any are omitted from the description, the clinician should remind the client. After the warning signs are reviewed, proper use of the competing response should be reviewed. This can be accomplished in the following manner.

"Could you please tell me all the instances when you are supposed to use the competing response?" (contingent on the habit or a warning sign)

"Could you please describe the competing response for me?" (can differ for each person)

How long are you supposed to do the competing response?" (for one minute)

"Could you please simulate a habit and do the correct competing response?"
"Could you please simulate your warning signs and do the correct competing response?"

If the client answers the questions and does the simulations correctly the clinician should praise him or her. However, if the client seems confused, answers incorrectly, or does not implement the role play accurately, the clinician should review that part of the procedure by using the training procedures outlined in Session 2.

Next, the social support person (if available) should be called into the room, and his or her concerns should be addressed. At this point the first booster session is complete. The client and support person should return for the second booster session one week later. The following booster sessions should be conducted in the same manner. After the second booster session, treatment may be complete if the data show a significant decrease in the target behavior and the results are acceptable to the client. If there has not been a significant decrease in the target behavior or the results are not acceptable, another booster session should be scheduled and possible problems should be addressed or another functional assessment conducted.

3. ANCILLARY PROCEDURES/CONCERNS

This section is included to assist the clinician with situations that may complicate the treatment or were not directly addressed in the treatment protocol. It includes sections on awareness enhancement and self-monitoring, compliance issues, nighttime habits, and application of habit reversal in a school setting.

3.1 Awareness Enhancement and Self-Monitoring

The purpose of awareness training is to increase the person's awareness of the habit and its antecedents, but in some cases awareness training is ineffective and thus habit reversal is likely to fail. If the awareness training procedure described in the protocol is ineffective, a self-monitoring procedure or the use of an awareness enhancement device could be implemented. In addition to the two previously stated procedures, weekly awareness training procedures (described in the protocol) should be implemented until the client is at criterion levels of awareness (i.e., 4 of 5 habits or warning signs recognized).
The self-monitoring assignment should consist of having the client record each time the habit occurs along with the antecedent behaviors. These recordings should occur for at least one-hour a day, and should be done during a time or situation in which the habit is most likely to occur. Using this self-monitoring procedure should help uncover warning signs for the habit as well as increase the client’s awareness of its occurrence.

An awareness enhancement device is an electronic device worn by the client, that is designed emit a tone whenever the individual raises their hand above a certain point (Rapp, Miltenberger, & Long, 1998). The clinician should arrange such a device to emit the sound whenever the client raises his or her hand above his or her neck. This sound should serve as prompt to use the competing response or stimulus to help the client recognize his or her habit.

### 3.2 Compliance Issues

As stated earlier, one of the primary reasons habit reversal may fail is because of poor treatment compliance. The client may not comply with treatment procedures for a number of reasons including social embarrassment, lack of motivation, or impaired intellectual ability. Regardless of the reasons, well-designed reinforcement procedures should increase compliance.

The purpose of the support person is to increase the use of the competing response through praise. However, social support will only be beneficial to the client if praise functions as a reinforcer for him or her. Verbal praise is a conditioned reinforcer to most people, but there are certainly individuals for whom praise is not reinforcing. In such instances an alternative reinforcer should be presented immediately after the individual correctly uses the competing response.

Another reason for treatment noncompliance is that the social support person may become a discriminative stimulus for the use of the competing response. In other words the frequency with which the client uses the competing response increases only in the presence of the support person. To increase the use of the competing response in the absence of the support person the support person should covertly observe the client or carry out unannounced checks. If the support person then observes the client correctly use the competing response, he or she could enter the room and praise the client for the correct use. Likewise, if the social support person sees the client engage in the habit and not use the competing response, he or she
should enter the room and remind the client to use the competing response contingent on the habit. This is similar to a procedure used by Long, Miltenberger, Ellingson and Ott (1999), in which a remote prompting procedure in addition to habit reversal was used to treat an individual with two oral-digital habits. One or both of the aforementioned procedures could be used until the competing response is being implemented correctly and consistently.

3.3 Night-time Habits

Many oral-digital habits (e.g. thumb sucking) occur when the individual is in bed. If the clinician is treating a nocturnal habit, a number of concerns become evident, including data collection and treatment implementation. First, the method of data collection must be changed.

Data collection on a nocturnal habit could occur in a number of ways (see Chapter 2 for an extensive review). An effective method for recording the occurrence of a nighttime habit is by videotaping segments while the client is asleep. The client can position a camera near the bed and a certain period of time can be scored for the percentage of occurrence. These data are important for determining treatment effectiveness and planning for treatment modifications. After data are collected on the rate of occurrence, an intervention should begin. Because habit reversal will likely be ineffective for a nocturnal habit, two possible alternative treatments are described below.

The first approach would be to apply an aversive (but safe) tasting substance to the client’s target digits before going to sleep (Friman, Barone, Christophersen, 1986). The aversive taste should decrease the rate at which the habit occurs. A second intervention consists of having the client wear some type of glove or a splint over their hands while he or she is asleep (Ellingson, et al., 2000; Lewis, Shilton, & Fuqua, 1981). Wearing the glove or splint makes it very difficult to engage in the habit and subsequently decreases the rate at which it occurs.

3.4 School Settings

Although this treatment manual is described for use in a clinic, it may be equally or more effective when implemented with children or adolescents in
a school setting. First, schools represent a more natural environment than a clinic setting. Second, psychologists, therapists, social workers, or counselors have a great deal of control over the client's environment in a school setting. As stated in the compliance section, one of the main reasons habit reversal may be ineffective is due to a lack of treatment compliance. Treatment compliance may be increased in a school setting by having the teacher properly reinforce the use of the competing response. Finally, teachers are also in an excellent position to gather direct observation data on the child or adolescent's habit. Although teachers can be a great asset to implementing the procedure, it is important that teacher assistance be carried out in a way that does not draw unnecessary attention to the child for his or her habit. It would be of little benefit to eliminate the habit at the expense of the child being singled out in front of his or her peers.

4. REFERENCES


5. APPENDIX A

Habit Reversal Treatment Protocol-Oral-Digital Habits
Therapist Checklist

Session 1

_______ Interview

_______ Identifying the habit
definition ____________________________________________
________________________________________________

_______ Identifying possible functions

_______ Sensory experiences surrounding habits

_______ Behavioral observation and setting up ongoing data collection

_______ Home-based methods

_______ In clinic methods

_______ Standardized assessments of other conditions and social functioning

RESULTS__________________________________________
________________________________________________
________________________________________________

_______ Discuss support person

"There is a part of the treatment in which we teach a person who is close to you to help you to remember to use the treatment procedure outside of the therapy session. Can you think of a person who would be willing to help you with treatment?"
Session 2

Awareness Training

_______ Provide a rationale for awareness training

"The very first thing we are going to do today is figure out just what your habit is like, and what happens just before you do your habit. After we know exactly what your habit is, we will do some exercises to help you become more aware of when it is going to happen. This very important because if you want to learn how to manage something you first need to know when it is happening."

_______ Operationally define the oral-digital habit

"Before we begin helping you with your habit we must come up with a clear definition of what your habit is. This is important in treatment for two reasons. First, in order to become aware of your habit you need to know exactly what the habit entails. Second, it is important that I know exactly what your habit is for effective treatment and communication between the two of us. I would like you to do is describe to me in detail, your habit."

_______ Identify "warning signs"

"Next, I want you to describe any feelings or other things you do or experience before your habit. It is very likely that you have certain feelings or do certain things prior to your habit and if we can figure out what these are then you will be more likely to predict when you will do the habit and thus have a better chance of successfully treating it. Could you please tell me any feelings or things you do prior to the habit."

_______ Have client acknowledge clinician-simulated habit

"We are going to help you continue to become more aware of your habit by having you acknowledge each time I simulate your habit. I would like you to say, "there's one" or raise your hand each time I simulate your habit. We do this because watching someone else do something is an effective way of becoming aware of your own behaviors. During the next few minutes I will be acting out your habit and would like you to inform me each time I do it."
Competing Response Training

Choosing the Competing Response

"The next part of treatment involves you finding a different behavior to do for one minute instead of your habit. I will help you select an appropriate alternate behavior. We will call this your competing response. A competing response should make it impossible for you to do your habit. Likewise, your competing response should be something you are
comfortable doing. Do you have any ideas for a behavior you would be comfortable doing and would prevent you from doing your habit?"

_____ Clinician simulates the competing response

"Great, now that you have selected a competing response I want to make sure you know how to use it properly. The competing response should be used for one-minute each time you start doing the habit or when one of the warning signs occurs. The reason you use a competing response is to give you something to do instead of your habit. After you use the competing response enough you should learn not to do the habit. In the same way you learned to do the habit, you can learn not to do the habit. Now, I am going to demonstrate how to properly use your competing response contingent on the habit."

_____ Clinician demonstrates how to use the competing response contingent on the habit

_____ Continue until correctly demonstrated 4 of 5 times

_____ Clinician demonstrates use of competing response contingent on warning signs

_____ Client demonstrates use of the competing response contingent on warning signs

_____ Continue until correctly demonstrated 4 of 5 times

_____ Instruct client to use competing response whenever the warning sign occurs

Social Support Training

_____ Identifying the Support Person

_____ Training the social support person

"Thank you for agreeing to help (the client) with the treatment. Your basic role is to help (the client) remember to use the exercise she has been taught. First I would like to tell you what (the client) has done so far. Before (the client) does her habit she will almost always do one of a number of warning signs, so (the client) and I did some exercises to help
her recognize each time she does one of those signs. Now every time she
catches herself doing one of the signs she is supposed to make fists with
her hands. She makes fists with her hands because that makes it difficult
for her to bite her fingernails. If she can keep making the fists instead, her
habit will eventually go away.

What I would like you to do is praise her when you see her making her
fists, and remind her to make the fists every time you see her biting her
fingernails."

——— Clinician demonstrates how to correctly praise the correct use of
the competing response

“When you two leave the clinic, I would like you (social support person)
to praise her for correct use of the procedure. You don’t have to do
anything special, just praise her as you would naturally. I will
demonstrate it one time, so you get the idea.”

——— Have support person demonstrate praising the client

“Okay, you saw me praise (the client) for the proper use of the competing
response. Now, I would like you to do the same thing. I’ll ask her to
demonstrate the proper use of the competing response and I would like
you to praise her. Whenever you are ready (client), you may demonstrate
the competing response and I would like you (social support person) to
praise her. Please use praise that is comfortable to you.”

——— Clinician demonstrates how to correctly remind the client to use the
competing response

“Good job praising the correct use of the competing response (social
support person). Now, I would like to demonstrate what you should do if
you see (client) biting her fingernails, but not using the competing
response.”

——— Clinician has the support person demonstrate reminding the client
when not using the competing response

“Now I would like you to practice reminding her when she does not use it.
Please (client), perform your habit but do not use the competing response,
and (support person) demonstrate reminding her. Whenever you are
ready, I would like you to perform your habit.”

——— Schedule Session 3 for one week later
Sessions 3 & 4

_____ Collect data collected since Session 2

_____ Review client progress

_____ Discuss any problems the client has had

_____ Review main components of habit reversal

"Could you please tell me all the instances when you are supposed to use the competing response?" (contingent on the habit or a warning sign)

"Could you please describe the competing response for me?" (can differ for each person)

"How long are you supposed to do the competing response?" (for one minute)

"Could you please simulate a habit and do the correct competing response?"

"Could you please simulate your warning signs and do the correct competing response?"

_____ If incorrect, review component
Chapter 13

Analysis and Treatment of Oral-Motor Repetitive Behavior Disorders

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1. OVERVIEW

Repetitive behavior disorders represent a large class of responses that encompass more than the familiar tics, trichotillomania, thumb sucking or nail biting. Surveys of care providers in residential settings have frequently found other stereotypic behaviors such as lip biting, skin picking, skin scratching and head banging (Troster, 1994). Similar results have been found in college students, where nearly 10% endorse repetitive occurrences of behaviors such as knuckle cracking, lip and mouth biting, object chewing, and scratching or picking (Woods, Miltenberger, & Flach, 1996). Most of these, however, are “subclinical” in that they do not typically interfere with adaptive functioning or present frequently in outpatient clinical settings (Arndorfer, Allen, & Aljazireh, 1998). Yet there are several oral-motor repetitive behaviors that are stable, “automatic” and appear to serve no social function (Hansen, Tishelman, Hawkins, Doepke, 1990), that do have a significant presence both in the extant literature and in the clinic; these include stuttering, bruxism, and rumination. All three involve oral-motor behavior of some kind but have no apparent common etiology, topography or function. Like other repetitive behavior disorders, however, each has been or could be targeted for intervention using common behavioral interventions for repetitive behavior disorders.
2. STUTTERING

2.1 Description

Stuttering involves disfluencies in the production of speech, including repetitions of word sounds, words, or phrases; prolongation of a word sound; or a hesitation when attempting to speak (Miltenberger & Woods, 1998; Leung & Robson, 1990). Stuttering occurs in all nationalities with an incidence of approximately 1% and a prevalence of 4 to 5% (Ingham, 1990). Recent studies suggest that there is a continuous diminution in the frequency and severity of stuttering over time as many children progress toward recovery, with an overall conservative estimate of a 74% recovery rate (Yairi & Ambrose, 1999). Stuttering typically begins between the ages of 2 and 6 years, with a mean age of onset of 5 years (Andrews et al., 1983). The ratio of males to females is about 2-3:1 in childhood and 4-5:1 by adulthood (Bloodstein, 1987).

2.2 Impairments in Social Functioning

In the absence of effective treatment, stuttering can be disabling socially and vocationally. Stutterers have been found to evidence increased anxiety (Craig, 1990) and also to have more difficulty securing job promotions or upgrades in occupation (e.g., Craig & Calver, 1991). Indeed, research suggests that although employers often conclude that stuttering does not interfere with job performance, they also acknowledge that stuttering does decrease employability, can interfere with promotion possibilities, and is generally a vocationally handicapping condition (Hurst & Cooper, 1983). In addition, negative perceptions by others of a stutterer's communication ability can result in more difficulties with social adjustment (Andrews et al., 1983). Thus, it appears that stuttering has a direct impact on general social adjustment.

2.3 Causes

The causes of stuttering are still uncertain. There is, however, growing acceptance that genetic factors play a prominent role in explaining the onset
of the disorder. In addition, physiological studies present a disorder that is characterized by unusual hemispheric processing and a speech motor control system that has an impaired timing and/or coordinative function. In sum, recent studies have strengthened the argument that stuttering has a physiological rather than environmental origin (Ingham, 1990).

However, this conclusion does not rule out environmental variables as important in the maintenance of stuttering. Unfortunately, the basic research in this area is scant and efforts to identify environmental variables are often drawn from treatment outcome studies. For example, there is some evidence that stuttering is the result of disrupted airflow involved in speech production, caused by increased tension in the vocal musculature (Brutten & Shoemaker, 1967; Healy, 1991). This tension in the vocal musculature is typically decreased following a stutter (Ingham, 1984), and behavioral models of stuttering then account for the maintenance of stuttering through a process of automatic negative reinforcement (Miltenberger & Woods, 1998). However, treatment studies have not typically measured changes in vocal musculature tension as a function of treatment so it is unclear whether observed differences in vocal musculature tension in stutterers are a cause or an effect of stuttering.

2.4 Behavioral Treatments and Effectiveness

There is now reasonable consensus that routinely treating every individual soon after onset of stuttering is unnecessary (Onslow & Packman, 1999). However, recovery rates are suspect, range from 40-80%, and make it far from certain that most stutters recover spontaneously (Ingham, 1990). Given that stuttering can be successfully treated in young children, there are some who believe that there is an urgent need to counter the widely held belief that stuttering will resolve if ignored (Prins & Ingham, 1983.)

There are numerous protocols for treating stuttering and research over the past 20 years has relied heavily on behavioral treatment programs. The most favored techniques for treating stuttering fall into three categories; mechanical aids for modifying stuttering, prolonged speech or some variant, and response contingent stimulation (Ingham, 1990).
2.4.1 Mechanical Aids

Mechanical aids are basically limited to two types of feedback devices; delayed auditory feedback (DAF) and electromyographic (EMG) feedback. In DAF, electronic equipment is used to deliver the sound of one’s own voice slightly after words have been spoken, requiring a slower rate of speech, thereby assisting the speaker in producing a prolonged speech pattern. However, it was soon discovered that the functional variable in reducing stuttering was the use of prolonged speech, not the device. Because prolonged speech can be achieved without a mechanical aid (Ingham, 1984), the device is rarely used.

EMG biofeedback involves using electronic equipment to give individuals information about vocal muscle tension levels which can then be used to reduce muscle tension believed by some to be associated with stuttering. Moore (1978) found that EMG biofeedback alone was not effective in reducing stuttering, however, Craig and Cleary (1982) did find reductions in stuttering after 15 EMG biofeedback training sessions for some subjects. However, treatment also included a self-management and generalization component, making it difficult to determine the independent effects of EMG biofeedback. In general there simply is not enough research on the efficacy of EMG biofeedback to draw reasonable conclusions.

2.4.2 Prolonged Speech

Prolonged speech procedures are based on the original behavioral work of Israel Goldiamond, who used delayed feedback in a negative reinforcement paradigm (Goldiamond, 1965) to teach subjects to speak in a slow, prolonged, fluent pattern (e.g., Webster, 1980). In Goldiamond’s method, a controlled stutter-free speech pattern was achieved by reducing the speaking rate and using extended vowels, reduced articulation, and gentle initiation of phonation. Numerous variations of this method have been developed and have been called smooth speech, delayed auditory feedback, prolonged speech, and Gradual Increase in Length and Complexity of Utterance (GILCU) treatment.

In GILCU, subject starts with one-word utterances that are gradually increased in length during reading, speaking, and conversation (e.g., Costello, 1980). The program often consists of upwards of 50 steps designed to gradually increase fluent speaking in reading, then monologue, then
conversation. As with all prolonged speech programs, the speech is gradually and progressively replaced by faster speech and speech rate until speech has been normalized.

Treatments modeled after the prolonged speech style of intervention have dominated stuttering treatment programs for decades (Onslow, 1992) and recent studies continue to investigate and report variations of prolonged treatment as an intervention for stuttering (e.g., Druce, Debney, & Byrt, 1997; Ryan & Van Kirk-Ryan, 1995). Indeed, prolonged speech methods are at the heart of most methods reported in the literature (Ingham, 1993). Generally, results have found that 1) prolonged speech produces significant reductions in stuttering immediately after treatment, 2) drop-out rates are low, 3) results are generally maintained up to a year, and 4) relapse is about 30%, especially for those who were most severe in baseline (Ingham, 1993). Unfortunately, the total time to establish effects, transfer and maintain them across settings range from 32 to 90 hours of total treatment time. In addition, although these treatment have been found to be of value with adults, their value with early stutterers is less clear (Ingham, 1993; Onslow, 1992). Many of the investigations with children are poorly controlled and do not permit reasonable conclusions to be drawn about effectiveness. On a more practical level, the treatment is arduous and is notorious for producing unusual sounding speech (Onslow & Ingham, 1987; 1989).

2.4.3 Response Contingent Stimulation

Early theories of stuttering had suggested that punitive behavior by parents may have been the cause of stuttering and that making individuals aware of stuttering could make the impairment worse (Van Riper, 1973). In spite of these concerns, researchers began looking at whether the response contingent consequences of stuttering could have a beneficial impact on the rate of stuttering. Reed and Godden (1977) found that a verbal correction procedure delivered contingent on stuttering (i.e., "slow down") significantly reduced stuttering in two preschool children. Christensen and Lingwall (1982) found that simply delivering a response contingent "No", was not effective, however, Salend and Andress (1984), found that a stuttering-contingent response-cost procedure was effective in significantly reducing stuttering.

A series of other studies have modified this approach and added a brief "time-out" period contingent on stuttering during which the subject is not
permitted to speak (e.g., Andrews, Howie, Dosza, & Guitar, 1982; Martin, Kuhl, & Haroldson, 1972) James (1981), for example, used a 2 second time-out, signaled by a therapist, and then a self-administered time-out and found significant reductions in stuttering, although the effects were not maintained. In a more recent study, Onslow et al. (1997) also evaluated the time-out procedure and found similar results. Another type of response-contingent stimulation has involved having parents deliver praise and tangibles for stutter-free speech while identifying a stuttering utterance and requesting the child to correct the utterance (Lincoln, Onslow, Lewis, & Wilson, 1996; Onslow, Andrews, & Lincoln, 1994;). Unfortunately, many of these studies have used only quasi-experimental designs. Thus, although the time-out procedure and its variants have been described as “the most profitable area of study regarding response contingent stimuli (Ingham, 1993), there have been few well controlled empirical investigations, little evidence of long term benefit, and even now, the “potential has not been realized experimentally”(Onslow, 1992).

A final form of response contingent stimulation that was originally developed in 1974 by Azrin and Nunn, commonly called “habit reversal,” involved 12 components designed to help stutters identify, anticipate, and regulate stuttering through a controlled or regulated breathing procedure. The initial results were impressive, with a reported 98% reduction in stuttered words after as little as two, 2 hour sessions. Follow up studies, however, have not produced nearly that level of success (e.g., Cote & Ladouceur, 1982; Ladouceur & Martineau, 1982). In addition, early studies were criticized for failure to demonstrate sustained benefits (Ingham, 1990). Perhaps this explains why much of the speech literature has ignored recent research on habit reversal treatment of stuttering as a form of response contingent stimulation. Reviews in the speech literature (now 10-15 years old but still prominent) of the regulated breathing procedure suggest that it represents an example of a vaguely described therapy with unsubstantiated claims of success (Ingham, 1984). Although many speech researchers view contingency management procedures as fundamental to much of stuttering therapy, simplified habit reversal has not typically been discussed as one viable alternative (Ingham, 1990; Ingham, 1993; Onslow, 1992). Recent research investigations of habit reversal, however, have refined and simplified the procedure and have consistently found significant reductions in stuttering (e.g. Caron & Ladouceur, 1989; de Kinkelder & Boelens, 1998; Elliot et al., 1998; Wagaman, Miltenberger, & Arndorfer, 1993) that can be sustained across several years (Wagaman, Miltenberger, & Woods, 1995).
The procedure, in its simplified form, typically involves 1) awareness training, including teaching the subject to describe and detect each occurrence of stuttering, 2) a competing response, including teaching the subject to use a diaphragmatic breathing and gentle onset technique contingent on each occurrence of stuttering, and 3) social support, involving home practice along with praise and feedback regarding use of the competing response.

Although it is unclear at this point which of these components or combination of components are critical, it seems unlikely that any one component is responsible in every case. Of course, use of a competing response is impossible without response detection, so its independent effects may be hopelessly confounded by awareness training. Social support may not be critical in treatment implementation with motivated adult stutterers, but treatment with children has frequently relied on parents to implement home practice sessions and deliver supporting consequences (e.g., Budd, Madison, Itzkowitz, George, Price, 1986; Elliott et al, 1998). In addition, the use of social support systems to run home practices and facilitate generalization may improve outcome and reduce restrictiveness of the procedures. Finally, self-monitoring (awareness training) alone is a well-known intervention in the behavioral literature and has been found to be, in some cases, effective as an independent intervention for stuttering (Bray & Kehle, 1998). Regardless, the simplified habit reversal procedure, with its three components, can be implemented in such a parsimonious and unrestrictive fashion (Elliott et al., 1998) that it makes clinical sense to use the procedure as a package until research suggests otherwise.

2.5 Conclusions Regarding Behavioral Treatment of Stuttering

There are numerous behavioral treatment options for treatment of stuttering. Mechanical aids such as EMG simply need more research and do not seem practical. Prolonged speech interventions are supported as a viable treatment option for adults but are not supported for use with children. In addition, they are time consuming and may result in unusual speech patterns. Variations of response contingent treatment such as time-out, SHR, and even awareness training having growing empirical support, are easily learned and taught, and can be incorporated into home-based training.
procedures. None of the studies, however, has demonstrated sustained effectiveness with all stutterers and it remains unknown the extent to which these procedures are differentially effective with different types of disfluencies. Recent research studies typically do not identify how specific types of disfluencies respond to treatment. In one exception, time-outs were reported to not be as effective for individuals whose stuttering was characterized by blocks rather than sound, syllable or whole word repetitions (Onslow et al., 1997). Onslow and colleagues suggested that this procedure may not be effective for blockers just because the procedure requires starting and stopping again, which is the principal deficit in fluency with an individual who blocks.

From a clinical perspective, the SHR procedure is attractive because it has growing empirical support, is efficient, and generally acceptable. But it is certainly not the only option, although guidance regarding how to match treatment with individual clients is, as yet, unavailable. In the mean time, SHR would appear to be the treatment of choice in dealing with uncomplicated stuttering in children and adults, particularly those with partial or whole word repetition disfluencies.

3. BRUXISM

3.1 Description

Bruxism refers to the nonfunctional clenching, gnashing or grinding of the teeth, that can occur when awake or during sleep (Cassis & McGlynn, 1988; Glaros & Melamed, 1992). It is often considered a parasomnia because it is an “undesirable physical phenomena that occurs predominantly during sleep (American Sleep Disorders Association, 1997). Prevalence estimates vary widely and are likely due to disparities in defining the condition (Long & Miltenberger, 1998). Reports range from 5 to 20% in adults without disabilities (Hublin, Kaprio, Partinen, & Koskenvuo, 1998) and 7 to 88% in children without disabilities (Glaros, 1981; Glaros & Rao, 1977). More recent reports have found prevalence rates of approximately 10-20% in nondisabled children from 3 to 13 years of age (Laberge, Tremblay, Vitaro, & Montplaisir, 2000). Incidences in individuals with disabilities have been reported in 13 to 41% of the population (Long & Miltenberger, 1998; Richmond, Rugh, Dolfi, Wasilewsky, 1984). There have been no consistent
gender or age differences observed (Cherasia & Parks, 1986; Laberge et al., 2000).

### 3.2 Physical Damage

The adverse effects of bruxism may include excessive tooth wear, periodontal problems, temporomandibular joint disturbances, and facial or head pain (Glaros & Rao, 1977). In addition, bruxism reportedly can result in hypertrophy of the masticatory muscles, resorption of the alveolar bone, and muscle and tooth sensitivity.

### 3.3 Causes

The prominent etiological view of bruxism highlights a CNS origin and a correlated role of sleep (Cassisi, McGlynn & Belles, 1987). Bruxism is thought to be differentially associated with REM sleep (Clarke & Townsend, 1984) and with transitions between sleep stages (Satoh & Harada, 1973) and has been found to be associated with distinct EEG changes (Rugh & Ware, 1986). Bruxism has also been thought to result from occlusal irregularities, from stress, and frequently from a combination of the two (Cassisi, et al., 1987). Finally, there is some physiological evidence that nocturnal bruxism is linked to daytime stressful events, suggesting that bruxism may be a learned behavior associated with stress reduction (Cash, 1988; Rugh & Harlan, 1988). However, there is increasing evidence that rather than malocclusion or stress, the primary etiology is found in an abnormally low arousal threshold during sleep (Parker, 1990; Westrup, Keller, Nellis, & Hicks, 1992).

### 3.4 Behavioral Treatments and Effectiveness

Treatment typically involves dental interventions and/or behavioral interventions. Oral splints are characterized by devices that protect or guard the teeth. A thin piece of hard plastic is made from an impression of the teeth and then worn to protect the teeth from wear (Christensen & Fields, 1994). However, the guard does not eliminate the grinding or clenching or the jaw joint and muscle pain that may arise from bruxism. Recent case
reports of dental interventions have also described an expensive botulinum toxin injection as an alternative for those with disabling bruxism that is refractory to other dental interventions (Tan & Jankovic, 2000) and an aversive taste treatment used along with a dental appliance (Nissani, 2000). Behavioral treatments have typically involved either biofeedback, punishment techniques, massed practice, or habit reversal.

3.4.1 Biofeedback Treatments

Biofeedback treatments have typically involved surface electromyographic (EMG) electrodes measuring masseter and/or temporalis EMG signals, which are then amplified to provide either an audible signal that varies with the frequency or intensity of muscular activity or triggers an alarm. Early studies involving auditory bruxing feedback found reductions in duration but not frequency of bruxing (e.g., Kardachi & Clarke, 1977). Later studies introduced an “arousal task” in which, for example, a subject would be required to walk across a room (to insure wakefulness) and record the time of the awakening (e.g., Clark, Beemsterboer, & Rugh, 1981; Feehan & Marsh, 1989). Across studies, data have suggested that auditory feedback of bruxism during sleep has differential effects depending on the presence or absence of a correlated arousal task requirement (Cassisi et al., 1987). On the whole, alarms plus arousal tasks reduce both durations and frequencies of bruxism. Additional studies have compared EMG biofeedback treatment with occlusal treatment (i.e., grinding away tooth surfaces that interfere with gliding contacts between teeth; Kardachi, Baily & Ash, 1978), stress management (Casas, Beemsterboer, & Clark, 1982), and muscle relaxation (Moss et al., 1982) and have found that nocturnal alarms are similar in effectiveness to these other treatments (Cassisi et al., 1987). Unfortunately, biofeedback interventions rarely eliminate bruxing and long term follow up have not been conducted. In addition, this intervention typically requires portable equipment that can be expensive and difficult to access. Patients must also be able to properly attach electrodes and set feedback thresholds to appropriate levels.
3.4.1 Punishment Techniques

Punishment techniques have been used more often with the developmentally disabled and have relied on contingent icing, contingent pressure, and overcorrection. Kramer (1981) had a teacher use her fingers to apply 2-3 seconds of pressure, contingent on bruxing, to the jaw of a child with mental retardation. Rudrud and Halaszyn (1981) also used contingent pressure, calling it a "massage" of the masseter, but they described a procedure that appeared functionally similar to the procedure used by Kramer. Blount, Drabman, Wilson, and Stewart (1982), applied ice briefly to the faces of two individuals with mental retardation, contingent on bruxing and Gross and Isaac (1983), used an overcorrection procedure with 2 children with mental retardation that required forced arm exercise contingent on bruxing. Although each of these studies produced reductions in bruxing, bruxing was not eliminated, and long term benefits are unclear. Given increasing concerns about the acceptability of aversive behavioral treatment procedures (Sidman, 1989) and the availability of nonaversive alternatives, it seems prudent to avoid these types of punishment procedures when possible.

3.4.3 Massed Practice

Massed practice typically involves having the patient voluntarily clench his or her teeth for a specified time interval several times a day and is similar to noncontingent competing response procedures have been studied with other habits disorders (Miltenberger & Fuqua, 1985). Early studies by Ayer and colleagues found that instructing patients to clench their teeth for 5, five-second intervals six times a day would produce reports of reductions in nocturnal bruxing, although no direct measures were taken (Ayer, 1976; Ayer & Levin, 1973). Other studies of massed practice have found no effects (Heller & Forgione, 1975), with these authors suggesting that the practice interval might have been too short for some patients. Another study investigated the use of 15 second clenching intervals alternated with 15 seconds of resting, repeated 10 times just before bed (Vasta & Wortman, 1988). These authors found, in an ABAB design, marked and sustained reductions in bruxing, although the bruxing was never eliminated. Although it is difficult to reconcile the effects of this technique with proposed etiologies involving REM sleep and sleep transitions, the massed practice may have a relaxing effect on the masseter muscles, as in a progressive
muscle relaxation procedure. Regardless, evidence suggests that it can be effective. This effectiveness, combined with being inexpensive, convenient and simple, makes massed practice a treatment worthy of consideration.

3.4.4 Habit Reversal

Habit reversal procedures have included variations of the original Azrin and Nunn (1973) procedure with components such as awareness training, competing responses and social support or contingency management. Watson (1993), found that bruxism was reduced simply by having patients aroused from sleep for 15-20 seconds by their spouses when bruxing was heard. Although this was called “arousal training” by the author, the procedure is described very much like one of the “awareness training” components of habit reversal. Although a 10 minute overcorrection procedure was then added (wash face, brush teeth, rinse mouth, repeat) and corresponded with the complete elimination of bruxing, the frequency of bruxing had already begun to show a significant trend toward elimination just from the awareness training.

Studies involving both awareness training and contingent competing responses have also shown promising results. Rosenbaum and Ayllon (1981) treated three college-age bruxers using a habit reversal protocol that included awareness training (response description, response detection, situation awareness, and habit inconvenience review), competing response (closing the mouth and clenching teeth for two subjects, opening the mouth until tension was felt for the other), and symbolic rehearsal (visualize situations in which bruxing occurs and practice the competing response). The subjects showed, in an AB design, marked reduction in bruxing with the treatment, although bruxing was not eliminated. Bebko and Lennox (1988) used a simplified habit reversal procedure with two children with autism who were bruxing. Treatment simply involved providing a verbal cue (“no grinding”), delivered contingent on bruxing and then a prompt to engage in a competing response involving opening the mouth for 10 seconds. Finally, the children were provided social support in the form of rewards for appropriate behavior. In a multiple baseline across settings, bruxing was markedly reduced for both subjects and completely eliminated for one. No follow-up measures were provided. Finally, Peterson, Dixon, Talcott and Kelleher (1993), demonstrated that a habit reversal procedure could markedly reduce the temporomandibular pain experienced by 2 out of 3
adult bruxers, but they did not collect data on actual teeth grinding or clenching. Overall, habit reversal and its various components have offered promising results in several small studies, however, the literature on habit reversal treatment for bruxism is quite limited and dated and firm conclusions about the applicability of habit reversal treatment and variations would be premature.

3.5. Conclusions Regarding Behavioral Treatment of Bruxism

In sum, bruxism is a difficult problem to eliminate. A variety of behavioral treatments have been attempted and almost all have shown some evidence of positive impact on bruxism. Yet there is no well developed, systematic program of research demonstrating any one procedure as the treatment of choice. Habit reversal is attractive because it is noncoercive and can be implemented without expensive equipment, but the few studies that have been done are only promising, not convincing. Interestingly, given that bruxism is proposed by many to be a disorder of sleep involving REM or sleep transition difficulties, it is surprising that no researchers have explored the use of interventions that have traditionally been used with other sleep transition problems, such as scheduled awakenings for night terrors (e.g., Lask, 1993). Until then, variations of habit reversal, such as massed practice, may be the treatment of choice.

4. RUMINATION

4.1 Definition and Prevalence

Rumination is the repeated regurgitation of previously ingested food (Johnston & Greene, 1992). It has been observed to occur most often after meals and often includes chewing and re-swallowing. Moreover, many authors further delineate that ruminative behavior seems to be "deliberate" in that individuals will engage in behaviors that induce regurgitation (e.g., Kedesdy & Budd, 1998; Sajwaj, Libet, & Agras, 1974). In contrast, Fredricks, Carr, and Williams (1998) report that the voluntary nature of ruminative behavior can be difficult to identify because the behavior can
appear "effortless" as it is practiced over time. In fact, various authors have described antecedents to ruminations as behaviors ranging from obvious forms of digital stimulation, mouthing the hand, or gagging motions of the neck region, to more subtle behaviors involving tongue movements, contractions of the abdominal muscles, or even postural changes (Glassock, Friman, O'Brien, & Christopherson, 1986; Konarski, Favell, & Favell, 1992).

It is generally well-accepted that although ruminative behavior is observed to some extent in normally developing individuals, especially infants beginning at three to six months of age (APA, 1994), it is most commonly seen in individuals with mental retardation. Prevalence in institutionalized individuals with mental retardation has been estimated at 6 to 10% (Fredericks et al., 1998); however, the prevalence and incidence of ruminative behavior among this population at large has not been studied. Moreover, no estimates are available for typically developing individuals (Parry-Jones, 1994) although recent case studies have documented the occurrence of ruminations in normally-developing adults (Amarnath, Abell, & Malagelada, 1986), adolescents (Khan, Hyman, Cocej, & DiLorenzo, 2000), and school-age children (Reis, 1994). It is suggested that prevalence is equal for males and females (APA, 1994) but there is some evidence that it is more common in males (Mayes, Humphrey, Handford, & Mitchell, 1988).

4.2 Associated Features

Historically, sequelae to chronic ruminations in infants have been thought to include malnutrition, weight loss, failure to thrive, and death (Sloan & Kaye, 1991). More recently, however, medical advances and early identification are leading to declining mortality and morbidity rates among infants with ruminations behaviors. In addition, there is increasing evidence that not all infants who ruminates experience impairments in growth and nutrition (Mayes, 1992). Among children and adults, associated features may include halitosis, dehydration, heartburn, lowered resistance to disease, malnutrition, esophageal inflammation, and dental complications, (Fairburn & Cooper, 1984; Kedesdy & Budd, 1998; Sajwaj et al., 1974). Moreover, Johnston and Greene (1992) point out that ruminative behavior is socially undesirable and may cause social rejection or, in the case of adults with mental retardation, may present a barrier to less restrictive placements.
4.3 Etiology

A behavioral account of the etiology suggests that rumination is a behavior of organic etiology that is maintained through contact with reinforcing environmental contingencies. Original organic mechanisms that can produce regurgitation can include temporary illness (Starin & Fuqua, 1987), higher gastric sensitivity, and/or a decreased threshold for lower esophageal sphincter relaxation during gastric distention (Khan et al., 2000; Thumshirn et al., 1998). An individual who exhibits frequent vomiting and/or regurgitation as a consequence of one of these organic mechanisms then has an increased opportunity to "discover" that the behavior produces social and/or sensory reinforcement (Kedesdy & Budd, 1998). For example, ruminative behavior might be strengthened and maintained when caregivers provide increased social attention (e.g., parent looks at individual and says "stop!") when the behavior occurs (e.g., Lavigne, Burns, & Cotter, 1981). Similarly, ruminative behavior may be strengthened and maintained if escape from an aversive stimulus (e.g., an unwanted meal or unpleasant activity) is provided when the behavior occurs. Finally, it has been suggested that ruminative behavior may be strengthened if it produces a reinforcing sensory experience such as tactile or gustatory reinforcement. The latter explanation is supported by the observation that ruminative behavior often occurs in the absence of a caregiver who might deliver reinforcement in the form of escape or social contact (Ball, Hendrickson, & Clayton, 1974).

4.4 Behavioral Treatments and Effectiveness

Given that rumination can often have an organic etiology, behavioral intervention should always be preceded by a thorough medical evaluation. Studies have shown that endoscopy and radiological studies can rule out as many as 50 to 90% of referrals for rumination disorders as due to congenital anatomic defects or oral-motor dysfunction. (Kuruvilla & Trewby, 1989; Rogers, Stratton, Victor, Kennedy, & Andres, 1992). In these cases, medical or surgical intervention can often successfully and rapidly solve the problem (Fredricks et al., 1998). However, even in cases where medical or surgical intervention is appropriate, behavioral intervention may be
necessary to manage environmental contingencies that come to bear on the ruminating.

Understanding which contingencies are most salient in the maintenance of ruminating may require an assessment of the function of the behavior. Indeed, considerable individual differences have been hypothesized as the controlling variables across individuals who ruminate, including social, escape, or automatic reinforcing functions (Johnston & Greene, 1992). Yet, little research has been conducted directly analyzing the potential multiple functions of ruminating. In one of the few exceptions, Humphrey, Mayes, Bixler, and Good (1989), examined the environmental variables associated with ruminating in a boy with mental retardation. The investigators recorded the frequency of ruminating throughout the day over a four-week period. Results showed ruminating behavior increased after meals and over the course of the day overall and decreased during periods when individual attention was provided (as opposed to independent play or non-school hours). The authors suggested that for this individual, ruminating may have been effectively decreased if attention and structured programming were provided immediately after meals (when ruminating was most problematic), however, there was no actual intervention to evaluate the utility of the assessment.

In another assessment of possible function, Applegate, Matson, and Cherry (1999) used a Questions about Behavioral Function (QABF) interview to assess 417 institutionalized persons with mental retardation. The QABF was used to examine potential variables associated with five severe problem behaviors, including ruminating. Applegate et al. (1999) determined the most common function of ruminative behavior in this sample was automatic reinforcement. Although the investigators recommended the QABF to clinicians as a means of developing more effective treatment programs, there was no actual demonstration of the use of the QABF in this capacity. Indeed, we were unable to find investigations relying on functional assessments to guide the development of interventions with ruminating. Instead, the literature on behavioral intervention for ruminating has relied on the development of treatments independent of behavioral function, resulting in two principle types of procedures; contingency management procedures and modified feeding/satiation procedures.
4.4.1 Contingency Management

The efficacy of contingency management interventions including both punishment and reinforcement procedures have garnered substantial empirical support. Punishment procedures were the first to be investigated and predominated the treatment literature through the 1980's. The use of aversive procedures has been generally well-researched, and a wide variety of aversive interventions have been identified as having some beneficial effect upon the frequency of ruminative behavior in adults with mental retardation.

Starin and Fuqua (1987) reviewed the data from 18 studies investigating punishment procedures for treatment of rumination. Aversive procedures included the use of contingent pinching (e.g., Minness, 1980), delivery of noxious tastes such as lemon juice (e.g., Marholin, Luiselli, Robinson, & Lott, 1980), and overcorrection procedures (e.g., requiring subject to brush with oral antiseptic after ruminating) (e.g., Foxx, Snyder, & Schroeder, 1979). In all cases a single-subject design or case-study method was employed, and the aversive consequence was delivered contingent upon the patient exhibiting ruminative behavior or, in some cases, specific behaviors antecedent to ruminating. In all of the studies, immediate reductions in ruminative behavior were observed subsequent to the intervention. However, generalization to meals outside the treatment setting was examined in only 4 of these 18 studies and was demonstrated in 3. In 8 of 9 studies, maintenance at 6 to 10 months was found to be at or near 0, however, of 5 studies examining maintenance at 10 to 12 months, 2 found ruminative behavior had returned to baseline levels.

Although interventions involving the presentation of aversive stimuli seem to offer some immediate benefit, data regarding long-term maintenance are more equivocal. Moreover, many service settings prohibit the use of aversive interventions, given concerns about misuse or even abuse of punishment procedures. Perhaps not surprisingly, few (if any) studies investigating punishment procedures have been conducted since the Starin and Fuqua review over a decade ago. More surprising, however, is the fact that contingency management alternatives to punishment have also not been extensively researched. Several single case investigations exploring extinction and differential reinforcement procedures were conducted over 20 years ago, finding mixed results. For example, two studies investigated extinction procedures in which access to proposed reinforcers such as escape and social attention was denied contingent upon rumination. These authors
found inconsistent outcomes and reported significant increases in other undesired behaviors during treatment (Wolf, Birnbrauer, Williams, & Lawler, 1970; Mulick, Schroeder, & Rojahn, 1980). Note, however, that because the success of an extinction procedure is dependent upon the accurate identification of the reinforcer for rumination, the functional assessment must be suspect in studies where the procedure is found to be ineffective. Studies of differential reinforcement procedures (e.g., delivering a reinforcer whenever ruminative behavior has not occurred for approximately 30 seconds with the interval being gradually lengthened as the rate of rumination decreases) have also found mixed results, have been conducted on a total of three subjects (Mulick et al., 1980; O’Neil, White, King, & Carek, 1979; Barmann, 1980) and have been criticized for significant methodological flaws (Starin & Fuqua, 1987). Finally, a procedure involving the delivery of noncontingent reinforcement found that social attention delivered before, during, and after mealtimes significantly reduced rumination (Whitehead, Drescher, Morrill, Corbin & Cataldo, 1985). Overall, however, too few studies with too few subjects have been conducted to draw firm conclusions about the wide applicability of these contingency management procedures and virtually no recent investigations have pursued this line of research.

4.4.2 Satiation/Modified Feeding

Another group of studies has examined the effects of satiation and/or modified feeding procedures for reducing rumination. The impetus for these interventions was the work of Johnston and his colleagues who demonstrated that feeding individuals to the point of satiation corresponded to significant decreases in the frequency of ruminative behavior after a meal (Rast, Johnston, Drum, & Conrin, 1981) and in subsequent meals (Rast, Johnson, & Drum, 1984).

The satiation procedure utilized by Johnston and his colleagues involves presenting clients with a meal containing “at least a double portion” of food and, as the client eats, adding more food to keep the tray full (Johnston & Greene, 1992). These authors emphasize that any foods may be presented but should be varied to avoid satiation on any one flavor. Moreover, in research protocols described above, clients were encouraged to continue to eat when their feeding slowed down, and the meal was discontinued only after the client refused more food on three successive prompts. These
authors report that none of the research to date has shown that the consumption of food at this rate has adverse effects on health, though it does often lead to substantial weight gain.

A similar protocol involving the use of modified feeding has also been described, wherein the noncontingent presentation of foods are provided to patients for a certain period of time after a meal. Specifically, Wilder, Draper, Williams, and Higbee (1997) demonstrated reduced ruminative behavior in a man with mental retardation by giving him a teaspoon of gelatin/pudding every 20-seconds for 30 minutes after a meal. Similarly, Thibadeau, Blew, Reedy, and Luiselli (1999) decreased rumination to near zero levels in a man with mental retardation by providing him with white bread for one hour after meals over 20 treatment days. Specifically, slices of white bread were presented "conspicuously" to the client during the hour following a meal, and was given to him whenever he signed, "eat". This procedure was superior to a DRO procedure, and rates were at zero at a 15-month follow up. The authors note that the client had gained a significant amount of weight as measured one year after the study, but that the supervising physician did not believe this gain posed a health threat or outweighed the benefits of the treatment for rumination.

In summary, satiation/modified feeding procedures provide a nonaversive alternative to management of rumination. The findings regarding the satiation procedures have been fairly robust; across a number of studies involving approximately 25 individuals with mental retardation, investigators have consistently observed marked and sustained decreases in ruminative behavior in the context of satiation (Johnston & Greene, 1992). In addition, recent research continues to demonstrate the benefits of this approach. It is, however, somewhat perplexing that the specific function served by the satiation procedure has not yet been identified in the literature. Johnston and his colleagues (Johnston & Greene, 1992) report that caloric density and oropharyngeal and esophageal stimulation (i.e., sensory reinforcement) associated with the satiation procedure may be important components in explaining treatment effectiveness, but the functional mechanism is still not well understood. An alternative hypothesis might view the continued consumption of food as a competing response, thereby disrupting the ruminative behavior. However, both Thibadeau et al., (1999) and Wilder et al. (1997) argue that it was actually the "satiation" (perhaps a type of disestablishing operation) that was the mechanism responsible for decreasing ruminative behavior in their study because rumination decreased throughout the day and not only during the hour when noncontingent feeding
engaged the client in an "incompatible behavior." Indeed, studies have shown that the satiation procedure appears to have an impact not only on the meal in which the extra food is presented but on the subsequent meal as well (Johnston & Greene, 1992).

4.5 Conclusions Regarding Behavioral Treatment of Rumination

Current behavioral treatments for rumination can be grouped into contingency management and satiation procedures. Overall, punishment procedures appear to have significant immediate benefits but can increase the frequency of other negative behavior, have questionable social acceptability, and have little supportive data in terms of generalization and long-term maintenance. Non-punishment contingency management procedures have some mixed empirical support, but have received little recent attention and have often been used in multi-component treatment packages so that their specific effects have not been isolated. Finally, satiation/modified feeding protocols have a strong body of empirical support with good follow-up data. Although it is unclear what specific function is addressed by this intervention, the data are fairly robust, the procedure is easily implemented, and the health risks are limited to associated weight gain. Interestingly, in spite of the strong support for habit reversal procedures with numerous other repetitive behavior disorders, we were unable to find any controlled investigations of this procedure in the management of rumination. One case study did report the complete elimination of rumination using a simplified habit reversal procedure with a typical 6 year old girl who had exhibited rumination for over a year (Wagaman, Williams, & Camilleri, 1998). The investigators used diaphragmatic breathing as a competing response, reasoning that controlled breathing might be incompatible with regurgitation. Although not a controlled study, this report adds support to the notion that the use of habit reversal procedures with individuals who ruminate warrants additional investigation.
5. CONCLUSIONS

Although stuttering, bruxism, and rumination all involve repetitive oral-motor behavior, they have no apparent common function. Perhaps most surprising is that in spite of the emphasis on the importance of function in applied behavior analysis, effective treatments have been developed for these three problems almost without regard to behavioral function. Procedures such as habit reversal, massed practice, and satiation have demonstrated marked improvements in stuttering, bruxing, and rumination behaviors respectively, yet we are no closer to understanding the principle function(s) of these behaviors. One might conclude that research efforts to assess and define the function(s) of repetitive oral motor behavior disorders are not important. But consider that each of these three treatments was only one of many behavioral interventions that have been explored across several decades for treatment of repetitive oral-motor behaviors. That is, the search to effective treatments for these oral-motor behaviors has not been efficient. Perhaps systematic research efforts to better understand and assess the function of repetitive oral-motor behaviors would have led more quickly to the identification and refinement of viable treatment options. It is our belief that it still can.

6. REFERENCES


Chapter 14

Repetitive Behavior Disorders in Persons with Developmental Disabilities

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1. INTRODUCTION

In this chapter, we summarize some of the issues related to repetitive behavior disorders exhibited by individuals with developmental disabilities. For the purposes of this chapter, we will focus exclusively on behavior that occurs independent of any observable effects on the immediate environment. We provide (a) an overview of theories regarding the etiology and maintenance of such behavior (with a focus on operant explanations), (b) a description of operant-based assessment and treatment procedures, and (c) clinical examples of operant treatments derived from behavioral assessments.

Repetitive behavior disorders in persons with developmental disabilities are typically referred to as stereotypy and include such broad classes of behavior as habits, motor and vocal tics, obsessive/compulsive behaviors, and some forms of repetitive self-injurious behavior (SIB). Very specific topographies or forms of this behavior have been described in the literature, and include hair pulling (Friman & Hove, 1987; Rapp, Miltenberger, Galensky, Ellington, & Long, 1999; Rapp, Miltenberger, Long, Elliot, & Lumley, 1998), mouthing (Vollmer, Marcus, & LeBlanc, 1994), pica (Goh, Iwata, & Kahng, 1999; Mace & Knight, 1986), and echoic speech (Charlop, 1983). Sequelae of these behaviors range from social stigma to tissue damage. Two general definitional classes for stereotypic behavior have been proposed in the behavioral
literature. First, Lovaas, Newsom, and Hickman (1987) defined these disorders as constituting stereotyped and repetitive movements that persist in the absence of social consequences and that appear to produce some type of sensory stimulation (e.g., visual, tactile, or vestibular). Thus, some researchers refer to stereotyped behavior as "self-stimulatory" behavior or as "self-stimulation," implying that the function of the behavior is to produce some unknown type of sensory stimulation. The second definitional class is based more on the structural properties of stereotypy and does not presume a self-stimulatory function. For example, Baumeister (1978) defined stereotypy as behavior characterized by "highly consistent and repetitious motor or posturing responses which are excessive with respect to rate, frequency, and/or amplitude and which do not appear to possess any adaptive significance" (p. 354). Regardless of the definition, a rather large percentage of individuals with developmental disabilities exhibits stereotypy. For example, Berkson and Davenport (1962) estimated that over two-thirds of the institutionalized population of individuals with developmental disabilities exhibited some form of stereotypy. Displays of stereotypy can also vary across subgroups not only in overall amount but also in the most common form or topography (e.g., individuals with Prader-Willi syndrome often display obsessive-compulsive behavior related to food seeking; DiMitropoulos et al., 2000).

2. THEORETICAL MODELS

Numerous theories regarding the etiology and maintenance of stereotypic behavior have been postulated in the literature, with psychoanalytic, organic, and operant explanations representing distinct perspectives. To the extent that treatment is often based on the theory used to explain the behavior, it is important to understand the function of each theory. It should also be noted that various theories might be useful for explaining the same behavior at separate points in time. Thus, the etiology of behavior, and its maintenance, may be explained by contrasting theories. For example, obsessive food-seeking behavior may emerge primarily due to organic reasons but may persist because of operant mechanisms. Thus, although distinct, the organic and operant theories are not always incompatible.

Psychoanalytic explanations were among the earliest attempts to explain stereotypy. According to Spitz and Wolfe (1949), stereotyped movements, such as body rocking, are grouped into a class of behavior termed autoerotic. Autoerotic behaviors are "manifestations of sexual impulses . . . not yet directed
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at any outer object. Each individual component of the sexual impulse works for a gain in pleasure and finds its gratification in its own body” (p. 85). Other psychoanalytic explanations of stereotyped behavior focus on the behavior as a way to express and relieve anxiety and tension (Klapper & Butterfield, 1968) or as a manifestation of poor ego identity or lack of a well-developed sense of self (Baumeister & Forehand, 1973). Although these hypotheses provide potential explanations regarding etiology, they are difficult to substantiate, and do not address how stereotypy is maintained over time. In addition, they do not address the distinct forms of stereotypy often found in specific subgroups. For these reasons, few current studies of stereotypy are based on psychoanalytic models.

An increasing number of studies are currently being published that evaluate the behavioral phenotypes associated with specific genetic disorders (e.g., Denckla, 2000). Several subtypes of organic-based explanations have been posited in the literature, and the following three subtypes provide examples of this theory.

One class of organic explanations posits that stereotyped behavior can be traced to chemical or structural brain pathology (Baumeister, 1978). This view is supported indirectly by findings that stereotyped behavior is often negatively correlated with IQ scores. The fact that stereotypy occurs more frequently among persons classified as severely to profoundly retarded than among persons with more mild disabilities (Davenport & Berkson, 1963) supports a relation to overall central nervous system pathology. Other evidence of an organic explanation comes from studies showing that certain genetic syndromes (e.g., Prader-Willi) are highly correlated with stereotypic behavior and that lesions in the brains of animals can produce stereotyped movements (Baumeister, 1978).

A second organic explanation is based on the supposition that a certain level of stimulation is optimal for the organism (homeostasis). When this level is not achieved, the organism engages in stereotypy, which serves to either increase or decrease stimulation (Baumeister & Forehand, 1973). For example, several researchers have posited that, due to the high degree of monotony associated with institutional settings, stereotypy develops in an attempt to achieve optimal levels of stimulation (Berkson & Davenport, 1962). A related view is that stereotypic behavior serves as a stimulus filtering function. Hutt and Hutt (1965), for example, found that stereotyped responding in mentally retarded children was positively correlated with environmental complexity. That is, the more complex the environment in terms of available stimuli, the more likely the occurrence of stereotypic behavior. One inference from this study is that the individuals were engaging
in stereotypy in order to "filter" extraneous environmental stimuli.

A third organic explanation posits that stereotyped responding leads an individual to experience altered states of consciousness. According to this view, the functional significance of stereotypy is that it decreases arousal, leading the individual to experience EEGs similar to those accompanying normal drowsiness (Stone, 1964). Another process through which behavior might lead to altered states of consciousness is through the response-contingent release of endogenous opiates. This process results in a state of euphoria and may also attenuate pain, such as that originating from ear or sinus infections (Thompson, Hackenburg, Cerutti, Baker, & Axtell, 1994).

Opioid-related accounts of the development and maintenance of stereotypic behavior are especially compatible with an operant theory, because it is possible to describe the change in biological events that results from stereotypy as automatic response products that reinforce operant behavior. For example, if the release of endogenous opiates is produced directly by a specific behavior, this constitutes a response-consequence relationship and, therefore, represents an operant contingency. As mentioned previously, the etiology of the behavior might be organic, but the maintenance might be operant.

In the operant literature, stereotypic behavior is often described as behavior that directly produces its own reinforcement (e.g., Ringdahl, Vollmer, Roane, & Marcus, 1997). Thus, reinforcement occurs automatically when the behavior occurs, and the behavior is described as serving an automatic function. As such, stereotypy constitutes a distinct functional class of behavior that is separate from behavior that is maintained by social functions (i.e., access to socially mediated reinforcers). Some researchers have demonstrated that stereotypy can be influenced by social reinforcers (e.g., Durand & Carr, 1987; Mace & Belfiore, 1990); however, the majority of studies concerning stereotypy have focused on behaviors that serve an automatic function. Within the functional classification of automatic reinforcement, there are two major subcategories: automatic positive reinforcement (e.g., production of sensory stimulation) and automatic negative reinforcement (e.g., escape from intense stimulation or biologic events such as pain).

The maintaining role of automatic positive reinforcement has been supported by studies demonstrating the effects of treatments designed to interrupt or replace the sensory products of stereotypy. Rincover (1978) reduced aberrant behavior exhibited by several individuals with developmental disabilities via a sensory extinction procedure. For example, to reduce the stereotypic plate spinning exhibited by 1 individual, a table was carpeted to eliminate the auditory feedback (the hypothesized variable responsible for
maintenance). This simple change reduced the occurrence of behavior and thus supported the hypothesis that plate spinning was maintained by automatic positive reinforcement. An alternative approach is to "enrich" the environment in order to provide stimulation that competes with the sensory stimuli maintaining stereotypy. Favell, McGimsey, and Schell (1982), for example, reduced SIB that had been resistant to socially mediated treatments by placing alternative stimuli in competition with the products of SIB. For 2 participants, allowing noncontingent access to popcorn reduced pica (ingestion of inedible objects). The fact that behavior evaluated in these sensory-based studies was resistant to socially mediated treatments, but was responsive to sensory extinction or alternative sensory stimulation, suggests that stereotypy was maintained by the production of sensory events (i.e., automatic positive reinforcement).

An automatic negative reinforcement explanation of stereotypic behavior is usually inferred when behavior serves to escape or avoid certain biologic states (e.g., discomfort) or to attenuate stimuli in the environment (e.g., auditory stimuli). Cataldo and Harris (1982) hypothesized that stereotypic self-injurious behavior (SIB) might emerge initially due to the production of endogenous opiates in response to pain. Evidence for an automatic negative reinforcement explanation comes from the finding that individuals with biologic conditions such as otitis media exhibit differentially higher levels of stereotypic behavior than individuals without this condition (de Lissovoy, 1963). Other biologic events, such as gastric discomfort, have also been demonstrated to be correlated with stereotypic behavior (Wacker, Harding, et al., 1996).

It is important to note that operant explanations of stereotypic behavior do not necessarily preclude other potential factors. For example, operant explanations can incorporate the production of organic compounds (endogenous opioids) or the cessation of organic processes (pain) for the maintenance of stereotypy. Indeed, although successful drug interventions with opiate blockers, such as naltrexone and naloxone, provide evidence that aberrant behavior is maintained through biological processes (e.g., Sandman et al., 1990; Thompson et al., 1994), it may be that the results are also obtained as either a function of extinction (i.e., no opiate high) or punishment (i.e., increased sensitivity to pain).

The above example illustrates the complex interaction that can occur between biologic and automatic reinforcement variables. Similar interactions can occur between social reinforcement and biologic variables (e.g., aberrant behavior occurs to escape demands whenever the person is sleep deprived [Kennedy & Meyer, 1996] or has pain [O’Reilly, 1997]), and possibly between
different categories of operant variables such as social and automatic reinforcers (e.g., stereotypy occurs to increase stimulation and to avoid social contact). However, a comprehensive examination of these types of complex interactions is beyond the scope of this chapter.

In the following sections, we describe behavioral assessment and treatment of one category of operant variables: automatic reinforcement. Although a few studies have shown social functions for stereotypy (e.g., Durand & Carr, 1987; Mace & Belfiore, 1990), most studies have identified automatic reinforcers as maintaining stereotypy. In addition, stereotypy maintained by automatic reinforcement has proven to be highly resistant to behavioral treatment and has not been studied as extensively as socially maintained aberrant behavior. Recent operant research has begun to increase our understanding of the behavioral mechanisms underlying stereotypy and, therefore, has led to successful behavioral treatment.

3. AUTOMATIC REINFORCEMENT MODELS

3.1 Identifying Automatic Functions of Behavior

Iwata et al. (1982/1994) noted that behavior maintained by automatic reinforcement, by definition, is not controlled by social events and, therefore, should occur in the absence of social reinforcers. To test this hypothesis, they constructed an alone condition within a functional analysis in which participants were placed in a room without social contact or extraneous materials. In this condition, no social contingencies (i.e., attention, materials, or escape from task demands) were provided. Thus, if behavior occurred at steady rates across alone sessions, a variable other than social reinforcement was, by default, responsible for maintenance. Behavior that occurred at high rates during the alone condition (relative to a free play and other test conditions) was described as serving an automatic function.

A number of variations of the functional analysis methodology have been posited to identify automatic reinforcement. For example, several investigators (Iwata, Pace, Dorsey et al., 1994; Ringdahl et al., 1997; Vollmer et al., 1994) suggested that an undifferentiated pattern across all test conditions of a functional analysis was indicative of an automatic function. If behavior was observed to occur at comparable levels across all conditions (social and nonsocial) of the functional analysis, this suggested that the presentation and
removal of social contingencies did not influence the occurrence of behavior.

In a review of 152 functional analyses conducted for SIB displayed by individuals with developmental disabilities, Iwata, Pace, Dorsey, et al. (1994) found that the functional analyses of 39 individuals (25.7%) fit one of these two patterns (responding highest in the alone condition or across all conditions), suggesting that for about one-fourth of the sample, SIB was maintained by automatic reinforcement. Of this number, SIB exhibited by 30 individuals was hypothesized to be maintained by sensory stimulation (automatic positive reinforcement), and SIB exhibited by 2 individuals was hypothesized to be maintained by pain attenuation (automatic negative reinforcement). No hypotheses were generated for the SIB exhibited by the remaining 7 individuals.

3.2 Matching Treatment to Functional Analysis Outcome

Typically, the results of functional analyses are used to allow clinicians to "match" reinforcement-based treatment to the function of a target behavior. For behavior maintained by social functions such as attention or escape from demands, treatment often consists of two components: (a) disrupting the response-reinforcer relationship maintaining a target behavior and (b) presenting that same reinforcer following a more acceptable, appropriate response. The results of the functional analysis are important because they identify the reinforcer that will be discontinued for target behavior and differentially provided for appropriate behavior.

Unlike behaviors maintained by social reinforcement, the reinforcers responsible for behavior maintained by automatic reinforcement are not readily identifiable via a functional analysis. Thus, the particular reinforcers to include in treatment are not apparent. However, in some cases, the various patterns of automatic behavior exhibited during a functional analysis (e.g., only during the alone condition; across test and control conditions) coupled with other assessment methods (e.g., stimulus preference assessments) can provide information that is critical to treatment. For example, the absence of problem behavior in conditions where alternative stimuli are available (e.g., free play) may indicate that the presence of alternative stimuli suppresses behavior. Thus, treatment might include some sort of exposure (either contingent or noncontingent) to alternative stimuli.

Steege, Wacker, Berg, Cigrand, and Cooper (1989) provided a demonstration of the use of alternative stimuli to decrease behavior maintained
by automatic reinforcement. During assessment, SIB occurred only during alone sessions in which no alternative stimuli were present. Following assessment, the participant was taught to press a microswitch that activated a fan. This stimulus was then provided as an alternative during alone sessions. Results indicated that the individual activated the switch to the exclusion of SIB. That is, access to the alternative stimulus suppressed engagement in SIB. Ringdahl et al. (1997) and Shore, Iwata, DeLeon, and Kahng (1997) described similar results. In each of these studies, providing access to alternative stimuli identified via a systematic preference assessment decreased automatically maintained SIB exhibited by individuals with developmental disabilities.

Taken collectively, the results of Steege et al. (1989), Ringdahl et al. (1997), and Shore et al. (1997) suggest that if alternative sensory stimuli can be identified, they can be used to decrease stereotypy maintained by automatic reinforcement. A logical question, then, is how to best select the alternative stimuli. Smith, Iwata, Vollmer, and Zarcone (1993) and Kuhn, DeLeon, Fisher, and Wilke (1999) evaluated the effects of two treatment procedures, one that matched the hypothesized function of behavior and one that did not, to clarify further the results of functional analyses. In both investigations, the results for 1 participant suggested a possible automatic function (behavior occurred within an alone condition) and one additional function: attention for Smith, Iwata, Vollmer, and Zarcone (1993) and escape for Kuhn et al. (1999). Two treatments, one that matched an automatic function and one that matched the alternative function, were compared for their effectiveness in reducing the occurrence of target behavior. In both investigations, the treatment procedure that matched an automatic function for behavior was more effective than the alternative treatment, indicating that the behavior was maintained by automatic rather than social reinforcement.

Thus, for durable treatment effects to occur, it might be important that the variability in behavior attributed to automatic reinforcement be identified and that alternative stimuli are available during treatment. Piazza, Adelinis, Hanley, Goh, and Delia (2000) demonstrated that the problem behavior of three individuals with developmental disabilities was maintained by automatic reinforcement. Treatment consisted of providing ongoing access to alternative stimuli. However, treatment varied in effectiveness depending on the nature of the stimuli available. Specifically, positive treatment outcomes were observed only if the alternative stimuli matched the putative sensory reinforcer provided by the problem behavior. For example, with 1 individual, saliva play was reduced only when matched stimuli (i.e., liquids such as shaving cream and shampoo) were available. When unmatched, yet preferred, stimuli (e.g., a
plastic ball) were available, saliva play continued to occur at high levels.

The results of current behavioral studies show that behavior maintained by automatic reinforcement occurs only in the absence of social contingencies or across social contingencies. It is currently unclear whether these represent distinct categories of functional behavior. Additional assessment procedures, such as stimulus preference assessments, are often required to identify competing sensory stimuli. Based on these results, distinct models of behavioral treatment have been suggested in the literature.

3.3 Models for Addressing Behavior With an Automatic Function

Vollmer (1994) described three categories of behavioral treatment for behavior maintained by automatic reinforcement. In the first category, treatment is achieved by attenuating the establishing operations associated with problem behavior. This treatment approach may be indicated when the behavior is putatively maintained by automatic positive reinforcement and is observed only during the alone condition of a functional analysis (or under conditions where no alternative stimuli are available). These assessment results would indicate that deprivation of distinct sensory stimuli increases the value of automatic reinforcers produced by stereotypy. Thus, treatment might consist of noncontingent access to competing stimuli. A second approach has been used to reduce aberrant behavior by providing alternative stimuli contingent on the absence of problem behavior or following an appropriate response. This approach may be indicated when problem behavior occurs across conditions of a functional analysis, but is relatively less preferred than engaging in some other, more acceptable behavior (Ringdahl et al., 1997). Finally, a third approach, extinction, involves disruption of the response-reinforcer relationship. Extinction typically involves blocking the response or blocking the sensation (i.e., the hypothesized reinforcer) produced by the response. This approach may be indicated when other treatment approaches are determined to be unsuccessful.

3.3.1 Attenuate Establishing Operations

Michael (1982) defined establishing operations as environmental events that momentarily influence (a) the effectiveness of a reinforcer and (b) the
frequency of responses associated with obtaining the reinforcer. In applied work with individuals with developmental disabilities, establishing operations have been studied within two distinct categories: (a) deprivation or satiation of a reinforcer (e.g., Vollmer & Iwata, 1991) and (b) the biological status of the individual (e.g., sleep, infections, or allergies; O’Reilly, 1995) that appear to be correlated with behavior maintained by negative reinforcement.

The absence of alternative activities and stimuli within the alone condition appears to function as an establishing operation for problem behavior. Ringdahl et al. (1997) demonstrated that problem behavior occurred in the absence of social reinforcement and alternative stimuli. When preferred items were available on a noncontingent basis, individuals participating in two of the four analyses engaged in the preferred stimuli almost to the exclusion of problem behavior. Rapp et al. (1999) demonstrated that noncontingent access to hair, collected from an individuals bed and after a haircut, reduced the level of automatically reinforced hair pulling exhibited by that individual. In each investigation, the presence of alternative stimuli appeared to alter the establishing operation (an absence of alternative sources of stimulation) associated with problem behavior, thus resulting in a reduction in the occurrence of problem behavior.

In the previous examples, problem behavior was most likely to occur when alternative sources of stimulation were not available. For some individuals, access to specific types of sensory stimulation appears to maintain problem behavior. In these cases, providing an alternative source of similar stimulation may reduce problem behavior. Goh, Iwata, Shore, DeLeon, and Kahng (1995) hypothesized that hand mouthing that served an automatic function was maintained by sensory stimulation to either the hand or the mouth. To test these two hypotheses, 4 women with a history of hand mouthing were given free access to a toy that could be manipulated as a substitute for hand mouthing. Data were recorded on the percentage of time each woman made contact with the toy with her hand, made contact with the toy with her mouth, and made contact with her mouth with her hand. The results of this analysis revealed that contact between the toy and hand was the most frequent response for each woman. These results indicated that stimulation to the hand was the predominant reinforcer for each woman’s behavior. Treatment then consisted of having the women manipulate items with their hands to increase alternative, more appropriate stimulation to compete with hand mouthing. This approach was successful in reducing hand mouthing for 3 of the 4 women.
3.3.2 Differential Reinforcement Procedures

In each of the preceding examples, access to alternative stimuli was provided on a noncontingent basis, and the participant was able to engage in problem behavior without losing access to those stimuli. An alternative approach would be to make access to the alternative stimuli contingent on the absence of problem behavior (differential reinforcement of other behavior [DRO]) or the exhibition of some appropriate alternative behavior (differential reinforcement of alternative behavior [DRA]).

For a differential reinforcement approach to be successful, two factors have to be present: (a) the alternative reinforcer competes effectively with the automatic reinforcers, and (b) the individual is able to "wait" or to engage in alternative behavior that is distinct from stereotypy. Ringdahl et al. (1997) used a combination of DRO and DRA to decrease the stereotypic SIB displayed by a young child with developmental disabilities. Specifically, a low frequency response, reaching, resulted in 20 to 30 s access to a preferred item (as identified by a stimulus preference assessment) if problem behavior did not occur for a 10-s period immediately prior to the reach response. During a functional analysis, the individual displayed SIB across all conditions (including free play). However, during a preference assessment, toy engagement was more likely to occur than SIB. Thus, it was hypothesized that access to toys could be made contingent on an alternative response plus the absence of SIB. The combination of DRO and DRA was effective in reducing the occurrence of problem behavior for this child, even though the same toys were not sufficient to reduce problem behavior when they were provided noncontingently.

3.3.3 Extinction

In the case of problem behavior maintained by automatic reinforcement, extinction requires that the automatic reinforcement provided by the stereotypy be discontinued. This disruption is typically accomplished by either preventing the behavior from occurring (i.e., blocking) or reducing the sensation provided by the behavior (sensory extinction) through the use of protective equipment such as gloves. This treatment approach is indicated when other, reinforcement-based approaches to treatment have been ineffective.

Lindberg, Iwata, and Kahng (1999) used response blocking to reduce self-injurious behavior that was maintained by automatic reinforcement for 2 men
who were diagnosed with profound mental retardation. For each participant, the noncontingent presentation of alternative sources of stimulation was not sufficient to reduce the occurrence of problem behavior. Response blocking was then implemented for both participants and resulted in decreased levels of self-injury for 1 participant.

Sensory extinction like response blocking is used to disrupt response-reinforcer relations. A common example is the use of protective equipment that reduces any sensations that are produced through the completion of the problem behavior. For example, Iwata, Pace, Cowdery, and Miltenberger (1994) and Kuhn et al. (1999) used helmets to reduce the sensations produced by head banging and face hitting for 2 males with severe mental retardation. These types of findings are not unique to persons with developmental disabilities. For example, Ellingson et al. (2000) used gloves to reduce the sensations provided by finger sucking for 2 normally developing children. Either stimulation to the mouth or stimulation to the fingers may have maintained finger sucking. The use of gloves attenuated both types of sensations and was effective for reducing finger sucking for 1 of the children.

4. CLINICAL ASSESSMENT AND TREATMENT EXAMPLES

In this section, we briefly describe case examples from our inpatient and community-based programs. Our purpose is to describe how various functional analysis response patterns indicative of an automatic function, coupled with the use of other evaluations, led to effective behavioral treatment. For two of the following case examples, problem behavior occurred across all functional analysis conditions and appeared to serve an automatic positive reinforcement function (i.e., access to stimulation). The result of subsequent analyses suggested different treatment approaches for the respective participants. For the third individual, problem behavior appeared to serve an automatic negative reinforcement function (i.e., escape from discomfort). Alleviating the discomfort, in turn, resulted in us being able to identify social functions that also maintained aberrant behavior.

The community-based outreach service was funded, in part, by the National Institute of Child Health and Human Development (Wacker, Berg, & Harding, 1996). The child’s primary care provider (usually parents) conducted all assessment and treatment procedures with coaching from therapists during visits to the child’s home. The inpatient program was a component of a
hospital unit that provided comprehensive assessment and treatment for individuals with developmental disabilities.

Both programs involved a multiphase model of assessment, treatment, and treatment evaluation. During the assessment phase, a functional analysis was conducted to identify the reinforcer(s) maintaining aberrant behavior. In cases where the results of the functional analysis were undifferentiated, further evaluation was conducted. This process included either an analysis of the response patterns during the functional analysis, preference/choice assessments, or a second functional analysis during which antecedents correlated with problem behavior were altered. During the treatment phase, parents and/or clinic staff conducted a treatment program (e.g., functional communication training) based on assessment outcomes. In our home-based treatment, we conducted weekly to monthly probes to evaluate treatment efficacy.

For the vast majority of the individuals seen by our services (approximately 80% of the inpatients and 90% of children in our home project), distinct social functions for aberrant behavior were identified and treatment involving differential reinforcement was used to successfully reduce problem behavior (Wacker, Berg, Harding, et al., 1998). In the remaining cases, social functions were not identified. Specifically, undifferentiated patterns of responding occurred across all the functional analysis conditions including free play. When these types of results were obtained on the inpatient unit, treatment was developed either based on the pattern of inappropriate behavior exhibited during assessment or on the results of stimulus preference/choice assessments. When these types of results were obtained in the community-based program, antecedent analyses provided information regarding antecedent variables correlated with problem behavior.

4.1 Case Example 1: Derek (inpatient)

Derek was a 2-year-old boy with mild developmental delays admitted for assessment and treatment of mouthing (placing inappropriate items such as hairs and carpet fibers in his mouth). During the functional analysis, a brush with hairs on it was available. Parents had reported that Derek would seek out brushes in the home, pull off a piece of hair, and hold it in his mouth. The functional analysis consisted of the following conditions: free play, alone, and ignore (functionally similar to the alone condition, except a therapist was present). Results of the functional analysis indicated that mouthing occurred primarily during the alone and ignore conditions. Thus, automatic
reinforcement was implicated as the maintaining variable. This response pattern suggested that stimuli available during the free-play condition might effectively compete with problem behavior. A choice assessment was conducted to evaluate which components of free play (access to toys or attention) competed with mouthing. This evaluation was done by making alternative stimuli (toys, attention, or both) available on one side of the room and materials for mouthing (hair in a hairbrush) available on the other side. In another condition, Derek was allowed to choose between the side with materials for mouthing and being alone. His time allocation to each side was recorded (based on Harding et al., 1999). Results of this evaluation indicated that Derek preferred any combination of toys and attention to the brush. In addition, the only time Derek chose the side with the brush was when neither toys nor attention were available on the other side. Thus, for Derek, we recommended noncontingent access to preferred items (i.e., toys) and attention as treatment.

4.2 Case Example 2: Sharon (inpatient)

Sharon was a 51-year-old woman diagnosed with severe to profound mental retardation. She was admitted to the inpatient program for assessment and treatment of SIB (self-scratching). The behavior had caused lacerations to her hands and forearms. Interviews with her care providers indicated the behavior occurred across all situations in her daily routines. During the functional analysis, problem behavior occurred across assessment conditions. In reviewing Sharon’s response pattern during the functional analysis, it was noted that, in addition to occurring across all test conditions (including the alone condition), SIB occurred during the free-play condition while Sharon was engaged in a preferred activity (pulling a wagon). Given that the preferred activity did not compete with problem behavior, a blocking procedure was implemented as treatment during both alone (i.e., no alternative stimuli) and free-play conditions. The results of the treatment evaluation suggested that blocking was an effective treatment during both the alone and free play conditions. Thus, we recommended to Sharon’s careproviders that an ongoing blocking procedure be implemented in her living environment.
4.3 Case Example 3: Tanya (home)

Tanya was a 5-year-old girl diagnosed with severe to profound mental retardation, cerebral palsy, and visual and hearing impairments (Harding, Wacker, & Berg, 2000). She was referred to the in-home project for assessment and treatment of SIB in the form of head and chin hitting, eye pressing, and hitting her knuckles together. During an initial functional analysis, Tanya was seated in her wheelchair during the free-play, attention, tangible, and escape conditions. The results of this analysis were undifferentiated in that Tanya displayed high levels of self-injury across all assessment conditions. Overall, across all conditions, she appeared to be uncomfortable. The functional analysis was then repeated with Tanya positioned on the couch. The results of this analysis showed that SIB was at zero, or near zero, levels during the free-play condition, but consistently elevated across attention, escape, and tangible conditions. Thus, Tanya’s SIB appeared to be socially mediated when she was not seated in her wheelchair, but appeared to have an automatic function when seated in the wheelchair perhaps because of discomfort.

Collectively, these case examples demonstrate that the results of functional analyses can indicate when behavior is likely maintained by automatic reinforcement. However, it is often necessary to conduct further evaluation in order to clarify the initial results (e.g., Tanya) or identify successful treatment strategies (e.g., Sharon).

5. SUMMARY

Repetitive behavior disorders in persons with developmental disabilities are likely produced and maintained by a complex interaction of biologic and operant variables. We have described some of these variables and suggested that even if behavior is related to biologic variables, operant mechanisms may still be maintaining the behavior. Based on this supposition, we suggest that behavioral treatment be considered. A difficulty with behavioral treatment for behavior maintained by automatic reinforcement is that we are often unable to match treatment to the specific variables that maintain repetitive behavior. A combination of functional analysis and assessments of stimulus preferences or antecedent events may be a good approach for clarifying both the operant mechanisms underlying behavior and the behavioral treatment components that may be effective in reducing the behavior.