Chapter 2

# Assessment of Repetitive Behavior Disorders

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## 1. INTRODUCTION

The purpose of this chapter is to provide an overview of methods for assessing repetitive behavior (RB) disorders (e.g., tic disorders, trichotillomania). The chapter begins by discussing two general approaches, behavioral assessment and functional assessment. These methods produce quite different outcomes than traditional diagnostic assessments or evaluations. The primary function of a diagnostic assessment is to determine whether an individual's problem behaviors meet the specific criteria for a psychological disorder, as defined by a classification system such as the *Diagnostic and Statistical Manual of Mental Disorders – 4th edition* (American Psychiatric Association, 1994). In contrast, the goal of a behavioral assessment is to define and quantify an individual's presenting problem behaviors so that treatment can be targeted and progress can be monitored. The purpose of functional assessment, a branch of behavioral assessment, is to identify the environmental variables (i.e., reinforcers) that maintain problem behavior. Behavioral and functional assessments can both be conducted regardless of whether the criteria for a psychological diagnosis have been met, as they each involve the description and explanation of the variables related to the occurrence of specific target behaviors, rather than diagnostic conditions. These behaviors may result in a psychological

diagnosis, but they can be quantified and conceptualized in the absence of one.

In addition to describing behavioral assessment and functional assessment methods, we describe how clinicians can assess social concerns and other psychological conditions that are relevant for individuals who present with RBs.

## 2. BEHAVIORAL ASSESSMENT

The initial goal of behavioral assessment is to identify and define an individual's problem behavior(s) so that a treatment plan can be specifically targeted. The assessment might occur over the period of several hours to several weeks, depending on client availability and the data that need to be collected. Once the client's RBs have been adequately identified and defined, behavioral assessment strategies can be used to evaluate them over time to monitor treatment progress.

Behavioral assessments typically include a variety of different methods, each providing the clinician with different information about the RB. These assessments are traditionally classified into two approaches: indirect and direct assessments. The defining feature of an indirect assessment is that the clinician does not actually observe the RB occur. The clinician instead relies on behavioral interviews, rating scales, and permanent-product measures to evaluate the RB. Alternatively, the hallmark of direct methods is that either the clinician or the client evaluates the RBs as they occur. Common direct assessment methods include direct observation in the natural environment (online) and from videotape samples, caregiver observation, self-monitoring, and automated recording.

Below are descriptions of the methods commonly associated with indirect and direct assessment approaches. We describe the indirect methods first, not because they are the most important or psychometrically rigorous, but because they often represent the initial methods used to gather information about RBs in a behavioral assessment.

### 2.1 Indirect Methods

As mentioned above, indirect assessment methods generally do not include direct observation of RBs as they occur. Instead, indirect methods allow the clinician to form impressions based on the information collected

from interviews with the client and significant others, rating scales and questionnaires, and occasionally, permanent-product measures. Although indirect methods are important to the behavioral assessment process, it is important for the clinician to constantly question the validity (i.e., "Does the assessment measure what it purports to assess?") and reliability (i.e., "How consistent is the outcome of the assessment?") of the methods that are employed. For example, a client may be given a rating scale to assess the frequency with which he bites his fingernails. However, due to embarrassment, he may underreport the actual frequency of the RB. If the clinician relied solely on this information, the integrity of the behavioral assessment might be compromised.

Below are descriptions of three common indirect assessment methods: behavioral interviews, rating scales (and questionnaires), and permanent-product measures.

### 2.1.1 Behavioral Interviews

The behavioral interview is often the first step in the behavioral assessment process. The purpose of a behavioral interview is to collect relevant information about the client, the current environment, and the RBs. The interview's outcome should inform the interviewer about the problems that need to be addressed (with subsequent assessment and treatment) and the specific behaviors that comprise those problems. In addition to the client, a behavioral interview might also include significant others, who often provide useful information. Relevant question areas might include the following: general client demographics; information about home, work, and leisure environments; sources of social support; what, when, and where specific RBs occur; the intensity of the RBs; medical history, including current and past medications; previous treatments; among others.

Behavioral interview formats are generally categorized as structured and unstructured, although they can vary along a number of dimensions. Clinicians often use both structured and unstructured methods during the behavioral interview process. A structured interview format includes specific guidelines on what questions should be included and how they should be asked. In addition, the questions are usually close-ended. That is, the client answers questions by choosing from specific options (e.g., frequently vs. infrequently). Although they are most often used for diagnostic evaluations, structured interviews can be quite useful during a behavioral assessment to help quantify the frequency and intensity of RBs.

The unstructured interview format typically occurs in a more conversational manner and includes open-ended questions that are asked at relevant conversational junctures. For example, if a client mentioned having a tic since childhood, the interviewer could use that as an opportunity to ask questions about life events that may have coincided with tic onset. It is important to clarify that all behavioral interviews are structured in terms of what information is sought (e.g., what, when, and where specific RBs occur); however, the form of the interview (i.e., the questions that are asked) may be unstructured.

Examples of RB interviews with psychometric properties reported in the research literature include: the Minnesota Trichotillomania Assessment Inventory-II (Christenson, Mackenzie, Mitchell, & Callies, 1991) for trichotillomania, and the interview sections of the Hopkins Motor and Vocal Tic Scale (Walkup, Rosenberg, Brown, & Singer, 1992), the Shapiro Tourette Syndrome Severity Scale (Shapiro & Shapiro, 1984), and the Tourette Syndrome Global Scale (Harcherik, Leckman, Detlor, & Cohen, 1984) for tic disorders.

At the end of the behavioral interview, the interviewer should summarize the results and begin formulating the case. Further assessment (e.g., direct observation; functional assessment) is often required before a treatment can be prescribed and implemented for the RB.

### 2.1.2 Rating Scales

Rating scales are paper-and-pencil assessments designed to quantify the impressions of clients, clinicians, and significant others about RBs. When a clinician is the rater, these scales are often used during a behavioral interview to help determine the importance and severity of RBs. When the client is the rater, the scale is considered a self-report measure. Although many consider self-report measures to have inherent validity problems (i.e., correspondence between self-report and actual events), the measures can nonetheless provide useful information about difficult-to-obtain phenomena (e.g., premonitory urges that occur before tics). Rating scales are often used during the functional assessment process (see 3.1. Informant Assessment below) to identify reinforcers that might maintain RBs. Rating scales are also frequently used to assess client satisfaction with treatment and outcome (e.g., Treatment Evaluation Inventory-Short Form; Kelley, Heffer, Gresham, & Elliott, 1989).

In a typical rating scale, which might include up to several dozen questions, the rater reads each question and provides an answer (i.e., a judgment) using a likert-type scale. The rater is asked to answer questions based on recently observed events, or on events that occurred in the more distant past. Answer scales typically include an ordinal dimension (e.g., 0 to 6) with corresponding descriptive "anchors." For example, the Motivation Assessment Scale (Durand & Crimmins, 1988) includes the following question and scale: "When the behavior is occurring, does this person seem calm and unaware of anything else going on around him or her?" [ 0 (never) to 6 (always) ]. After the rater completes the scale, the answers are quantified to summarize important features of the RB. Rating scales are often incorporated into questionnaires, which might include additional "open-ended" questions. Many of the rating scales and questionnaires that are used to quantify RBs are administered during structured and semi-structured behavioral interviews.

Examples of RB rating scales with psychometric properties reported in the research literature include: the National Institute of Mental Health-Trichotillomania Severity Scale (Swedo et al., 1989), the Psychiatric Institute Trichotillomania Scale (Winchel et al., 1992), the Trichotillomania Impairment Scale (Swedo et al., 1989), and the Yale-Brown Obsessive-Compulsive Scale modified for Trichotillomania (Stanley, Prather, Wagner, Davis, & Swann, 1993) for trichotillomania, and the observation sections of the Hopkins Motor and Vocal Tic Scale (Walkup et al., 1992), Tourette Syndrome Global Scale (Harcherik et al., 1984), Shapiro Tourette Syndrome Severity Scale (Shapiro & Shapiro, 1984), and Yale Global Tic Severity Scale (Leckman et al., 1989) for tic disorders and Tourette Syndrome. In addition, the following rating scales were designed for parent and/or self raters: the Massachusetts General Hospital Hairpulling Scale (Keuthen et al., 1995; O'Sullivan et al., 1995) for trichotillomania, and the Motor Tic, Obsessions, Vocal Tic Evaluation Survey (Gaffney, Sieg, & Hellings, 1994), and Tourette Syndrome Symptom List (Cohen, Leckman, & Shaywitz, 1985) for tic disorders. We refer the reader to Deifenbach, Reitman, and Williamson (2000), Elliott and Fuqua (2000), and Kompoliti and Goetz (1997) for more in-depth coverage of rating scales for trichotillomania and tic disorders.

### 2.1.3 Permanent Products

In certain cases, it might not be possible (or practical) to directly observe RBs as they occur in the natural environment. For example, it might not be possible to record the hair pulling of an individual who engages in the behavior only when in private. Similarly, it may be difficult to directly measure some RBs because of reactivity of observation or client embarrassment. In these situations, it might be possible to evaluate permanent products instead. A permanent product is a relatively enduring physical change made by the RB to the environment. For example, hair pulling might result in observable hair loss (e.g., a bald patch) that could be measured over time using photographs. Other permanent products of hair pulling might include measures of hair density and collections of pulled hairs (Elliott & Fuqua, 2000). Similarly, nail biting might result in observable damage to the nails and cuticles that could then be measured. Permanent-product measures are desirable because they do not require direct observation of the target behaviors as they occur. In addition, permanent product measures are useful when communicating with clients, significant others, and professionals because they are generally easy to evaluate.

Although permanent products are relatively easy to assess, there are disadvantages associated with their use. First, many RBs (e.g., tics) do not leave physical products. A second problem with permanent products is their validity as an assessment method. In many cases, the products made by the RB could also have been produced by other behaviors. For example, intense thumb sucking might result in visible tissue discoloration; however, such damage would be a questionable permanent product because of the possibility of other conditions (e.g., a rash) producing the same product.

Two general questions can be asked to determine the feasibility of using permanent products to assess the occurrence of RBs. First, does each instance of the RB result in a physical change? Second, do any other behaviors result in the same change? If these questions cannot be satisfactorily answered (i.e., "yes" to the former and "no" to the latter), then permanent products may not be a useful method for a particular case. Even with behaviors that do not leave physical products, videotaped records can be conceptualized as a form of permanent product for later scoring [see 2.2.2 Direct Observation (videotaped) below].

## 2.2 DIRECT METHODS

The aforementioned indirect methods are most useful for the initial stages of a behavioral assessment. However, it is also important to directly observe RBs as they occur to (a) adequately identify and define their relevant behavioral dimensions (e.g., frequency, intensity) and (b) determine treatment effectiveness. Once the relevant dimensions have been selected, stable measurement of the behavior must be conducted to ensure objective evaluation of the intervention for reducing the relevant dimensions of the RB. The selection of a particular direct assessment method should generally depend on the following variables: (a) the age of the client, (b) the intellectual functioning of the client, (c) the nature of the RB (i.e., Is there an available permanent product?), (d) the circumstances in which the RB occurs, and (e) the form (i.e., topography) of the RB.

Direct methods are those procedures that, at a minimum, evaluate at least one dimension of the RB as it occurs. With each assessment method, emphasis is placed on inferring an accurate representation of the RB from relatively brief samples of time in the natural environment. A variety of recording procedures can be used for direct assessment. Frequency (event), duration, interval, and time-sampling recording procedures can be selected depending on the relevant dimensions of the RB and the resources available for direct assessment. We refer the reader to Cooper, Heron, and Heward (1987) for a detailed description of each of these methods. Several variations of direct observation may be utilized to broaden the assessment to as many behavioral dimensions as possible and to produce converging data about the target behavior. Regardless of the method, a second, independent observer should also record data on the same behavioral dimension for approximately 20% to 30% of the observations to reduce the likelihood that the sample is misrepresented. When evaluating behavior in clinical settings, it is generally desirable to have at least 85% agreement between two observers.

The following sections describe the conditions/contexts under which procedures classified as direct assessment methods have been and can be applied, alone and in combination, to evaluate tics, hair pulling, and other RBs.

### 2.2.1 Direct Observation (online)

Online direct observation involves the observation of an individual's behavior by a trained observer through a one-way mirror in clinical settings, in naturally occurring settings (e.g., school or home), and in specifically arranged contexts (e.g., during family meals, while a child does homework). The procedure enables the observer to document via a checklist or laptop computer (see Kahng & Iwata, 1998 for a review of commercially available software programs) relevant antecedents and consequences during an observation period, in addition to relevant dimensions of the target behavior. Online observation should be considered when the individual has a developmental disability, is under the age of 6 years, the target behavior does not yield a permanent product, and the behavior is known to occur (based on informant reports) in the presence of others. It should be noted that many individuals engage in RBs (e.g., hair pulling, finger sucking) in the absence of a social observer. Therefore, the presence of an observer in a stimulus context that is normally void of this observer may result in an inaccurate assessment (i.e., reactivity) of the RB. This relative disadvantage is compounded by the necessity of having a reliability observer occasionally present.

### 2.2.2 Direct Observation (videotaped)

An alternative to online direct observation is videotaped observation. With videotaped observations, behavior can be recorded during periods when the individual is alone or in the presence of individuals in naturally occurring situations. Likewise, behavior can be videotaped from behind one-way mirrors in a clinical setting. In the case of the former, the video camera is placed in the relevant context and the individual is permitted to engage in his or her typical activities (Miltenberger, Rapp, & Long, 1999). The videotape is later scored by observers. The same data that are collected in online direct observation are available, but the observer need not be present during the assessment period. Likewise, a second observer can view the video segment at a separate time for interobserver agreement purposes. With this procedure, data can be collected on a number of behavioral dimensions such as frequency, duration, and inter-response time (i.e., the time between the offset of one response and the onset of a subsequent response; Rapp, Carr, Miltenberger, Dozier, & Kellum, in press).

In addition, the exact onset and offset of a response can be assessed, as well as the behavior frequency, to yield a "real-time" (i.e., second-by-second) measurement of behavior. A number of studies have utilized real-time videotaped observation to evaluate the duration of children's hair pulling and finger sucking in clinical settings (e.g., Miltenberger, Long, Rapp, Lumley, & Elliott, 1998) and in their homes (e.g., Ellingson et al., 2000; Rapp, Miltenberger, Galensky, Roberts, & Ellingson, 1999). In addition, concomitant behaviors such as hair manipulation (e.g., Rapp, Miltenberger, Galensky, Ellingson, & Long, 1999) and hair ingestion (i.e., trichophagia), which are typically secondary to the target behavior but relevant in treatment planning, can also be detected.

It is important to note, as with online observation, that the presence of a video camera can produce client "reactivity" that might result in misrepresented samples of behavior. However, despite potential reactivity, repeated exposure to the video camera should eventually result in "habituation" to its presence, which would be reflected in subsequent stability in the level of the RB (Kazdin, 1998).

### 2.2.3 Direct Observation by Caregivers

Instead of using professional observers, observations can also be conducted by individuals (e.g., teachers, parents, group-home staff) who are part of the client's natural environment. Observers are equipped with counters and/or data sheets with which to record the occurrence of the RB in the natural environment. This procedure should be used in settings that do not permit intrusion by video cameras, where additional observers would be disruptive, and where at least one adult (who is part of the natural environment) is available and willing to be trained to accurately document the RB.

Direct observation by caregivers can be particularly useful when the RB occurs in numerous stimulus contexts within the client's home. For example, Watson and Sterling (1998) collected data on the frequency of a 4-year-old girl's vocal tics during meal times and other activities using both of her parents as observers. Likewise, after conducting an initial assessment of finger sucking and object attachment of eight children in a clinic, Friman (1990) trained the mothers to collect data on occurrences of their child's behavior using a time-sampling procedure. During approximately 20% of these sessions, fathers served as reliability observers. Thus, even though this approach is recognized as the weakest form of direct observation (when used

alone), high agreement between two minimally trained observers provides acceptable confidence in the veracity of the sampled behavior.

Observations by caregivers can also be used to enhance or verify data collected with other procedures (e.g., videotaped recording). For example, in an investigation involving the assessment and treatment of finger sucking in children's homes, Ellingson et al. (2000) had parents conduct intermittent checks of their child's behavior (in the "habit prone" context) on days when videotaped observations were not conducted. The combination of two observation procedures also provided support for the generalized reduction in finger sucking (i.e., when a video camera was not present).

### 2.2.4 Self-Monitoring

Self-monitoring is a direct observation approach that involves data collection on one or more dimensions of an RB by the client. The individual is equipped with a recording apparatus (e.g., hand counter, note cards) to enable efficient documentation (i.e., with minimal response effort) of the occurrence of the RB. Although this approach yields the least rigorous data of the direct approaches, it is well suited to the assessment of the RBs of older children and adults of typical intellectual functioning, particularly when the RB occurs in the absence of other relevant social observers and across various of stimulus contexts. To adequately utilize self-monitoring, it is imperative that the individual demonstrate an ability to accurately detect, and thereafter record, instances of the RB. This demonstration should ideally occur in the clinician's presence during the training of self-monitoring skills. Self-monitoring behaviors should always be taught, like any other therapy-related skill (e.g., Bornstein & Hamilton, 1978). In addition, any self-monitoring data sheets should be simply designed, preferably in collaboration with the client. Likewise, there should be evidence that the individual is sufficiently motivated to document occurrences of the RB. Individuals who are self-referred may already be sufficiently motivated to record their RBs, whereas others may need guidance to recognize the social ramifications of their behavior (see Azrin & Nunn, 1973).

Many individuals are able to describe and demonstrate their RB with great fidelity; however, others, particularly those who pull hair, may engage in the RB without "awareness" or they may underestimate its occurrence (e.g., Azrin, Nunn, & Frantz, 1980; Winchel et al., 1992). This problem can be remedied by teaching the individual to become more aware of the RB using

simulation training (see Rapp, Miltenberger, Long, Elliot, & Lumley, 1998). In addition, clients can be taught to deliver a report of their behavior at specific times (e.g., Twohig & Woods, in press) in an effort to provide implicit social contingencies on their recording behaviors. A further consideration is that even though the individual has been trained to monitor his or her own RB for the purpose of behavioral assessment, this procedure may actually reduce the RB. A number of researchers have reported that self-monitoring significantly decreased the occurrence of tics in children and young adults (e.g., Billings, 1978; Ollendick, 1981; Thomas, Abrams, & Johnson, 1971). Another possibility is that although an accurate assessment of RB frequency may be obtained with self-monitoring, this mode of assessment may alter other dimensions (e.g., duration) of the RB due to its physical incompatibility with recording. In the absence of alternative assessments, it may be useful for clinicians to consider self-monitoring as a method to evaluate the RB, with the expectation that a positive side effect of this assessment may be a reduction in the recorded behavior.

### 2.2.5 Automated Recording

The objective assessment of behavior will always pose some difficulty when human observation is required. A few techniques have been developed to evaluate some RBs without the aid of human transducers, but none is without its idiosyncratic limitations. For example, to evaluate the occurrence of finger sucking in the absence of a parent, Hughes, Hughes, and Dial (1978) developed a "behavioral seal" that could be placed on the fingernail of the target finger. If the child wearing the seal engaged in finger sucking, the seal turned blue because of contact with saliva. Thus, a permanent product of finger sucking could be artificially imposed to evaluate the behavior. However, these seals do not indicate the length of time the child engaged in the target response (i.e., the relevant dimension of this behavior).

An apparatus known as the Awareness Enhancement Device (AED; Rapp, Miltenberger, & Long, 1998) was initially developed to treat hair pulling, but was later adapted to assess and treat finger sucking as well (Ellingson et al., 2000). The AED is a three-piece electronic apparatus (one unit is worn on the chest and one unit on each wrist) that is worn by an individual who engages in hand-to-head RBs (e.g., hair pulling, finger sucking). When activated, this device emits a ~65 dB tone contingent on placement of the wearer's hand within 6 in. of his or her head. The device has also been enhanced so that it collects data on the frequency and duration of hand-to-head behaviors. Thus, data can be collected in a variety of settings without

cumbersome observational techniques. It is important to stress that assessment devices such as the AED are still in experimental stages and have yet to replace traditional direct observation methods.

## 3. FUNCTIONAL ASSESSMENT

The term "functional assessment" refers to methods used to identify a behavior's maintaining or controlling variables (i.e., the behavior's proximal cause). These variables are typically conceptualized as environmental consequences that may serve to reinforce the RB. Although some RBs (primarily tics) have significant biological correlates, many do not. Regardless of such biological influences, many RBs are affected by the environmental consequences that follow them. For example, Carr, Taylor, Wallander, and Reiss (1996) demonstrated that the transient tic disorder of a 9-year-old typically developing boy was exacerbated by contingent adult attention. Further, a cursory review of the recent literature on the assessment and treatment indicates several examples of RBs maintained by social attention and/or self-stimulation (e.g., Carr et al., 1996; Ellingson et al., 2000). It is because of these environmental influences that all RBs should be assessed (at some level) to identify their reinforcing consequences prior to treatment selection.

Within the field of behavioral psychology as it pertains to the treatment of the problem behavior of individuals with developmental disabilities, it has become standard practice to conduct functional assessments prior to treatment selection. Research indicates that interventions based on functional variables are more successful than those based on non-functional variables (e.g., Iwata, Pace, Cowdery, & Miltenberger, 1994; Repp, Felce, & Barton, 1988). Additionally, identifying functional variables before treatment can save time that might have been wasted implementing ineffective interventions. While interventions based on non-functional variables might be immediately successful, the maintenance of treatment gains presumably would not be as durable compared to functional treatments because the RB could eventually come in contact with the original maintaining contingency (Vollmer & Smith, 1996).

There are three general approaches to conducting functional assessments: informant assessment, descriptive assessment, and experimental analysis (Lennox & Miltenberger, 1989). Each level of functional assessment varies along at least two dimensions. The first dimension is the ease with which the assessment can be conducted, with informant assessments generally

requiring less effort than descriptive or experimental methods. The second dimension is the degree of confidence in the assessment's outcome, with experimental methods producing causal information, compared to the correlational information provided by descriptive and informant methods. We will briefly discuss each of these approaches and include examples of their use.

## 3.1 Informant Assessment

The term informant assessment refers to the collection of information relating to a behavior's functional variables via indirect methods. The most common methods of informant assessment are behavioral interviews and rating scales. Behavioral interviews consist of asking relevant persons a series of structured questions relating to behavioral topography, antecedent and consequent stimuli, and other possible applicable variables (e.g., O'Neill et al., 1997). Another informant method is to have relevant parties (e.g., significant others) complete rating scales and questionnaires about the RB and its possible functions. For example, the Motivation Assessment Scale (MAS; Durand & Crimmins, 1988) is a 16-item questionnaire designed for collecting indirect data on four possible behavioral functions.

Informant assessments are useful because they take little time to complete and are relatively easy to administer. In some cases in which extended assessment is not possible, they provide information that would not otherwise be obtained. However, there are limitations in the use of informant assessments. With the possible exception of the MAS, adequate psychometric research has not been conducted on many of the informant instruments (for a review of these instruments, see Sturmey, 1994). Information obtained using informant techniques is not based on direct observation of current instances of the behavior and, therefore, is of limited value. The best use of informant methods is when they are employed as hypothesis-generating tools in conjunction with either descriptive or experimental methods.

## 3.2 Descriptive Assessment

A more rigorous approach to functional assessment is the descriptive assessment. Descriptive methods involve the direct observation of behavior in the naturalistic environment in order to detect possible controlling

variables. One common method, ABC recording, provides data on stimuli that are present immediately prior to and after a behavior occurs (e.g., Bailey & Pyles, 1989). These data can then be interpreted in the form of conditional probabilities (Lerman & Iwata, 1993). That is, the probability that the target behavior occurs given the presence of a stimulus versus the probability that the target behavior occurs given the absence of that stimulus may provide information relevant to behavioral function. Another descriptive assessment method is the scatter plot (Touchette, MacDonald, & Langer, 1985). This entails visually plotting the time of each occurrence of the target behavior on a graph each day. Thus, a visual picture of the time of occurrence of the behavior is obtained, allowing further examination of temporal variables (e.g., time of the day, day of the week).

While the aforementioned descriptive assessment methods typically provide more thorough information than informant methods, they too lack a sound research base to support their use (e.g., see Kahng et al., 1998). Further, the data obtained from a descriptive assessment are correlational, and do not necessarily indicate a causal relationship between the variables. In order to determine the exact causal nature of functional variables, an experimental analysis must be conducted.

## 3.3 Experimental Analysis

The most researched method of functional assessment is the experimental or functional analysis. In an experimental analysis, relevant variables are directly manipulated and their effects on the target behavior observed. There have been dozens of studies reporting the utility of experimental analysis variations and the successful interventions that resulted. Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) developed the initial procedure for determining the maintaining variables of self-injurious behavior (SIB) in analogue settings. Normally using a multielement design, approximately four conditions are presented to each client. In each condition, a specific variable is manipulated in order to test behavioral sensitivity to different consequences. For example, in the attention condition, social attention is typically provided contingent on the occurrence of the target behavior. If the target behavior rates are higher in this attention condition compared to other conditions, it is concluded that social attention is a maintaining variable for the behavior. An intervention based on social attention (e.g., attention extinction, noncontingent attention) is subsequently implemented.

The procedure developed by Iwata et al. (1982/1994) has been replicated with different populations and behaviors and can be conducted in analog or naturalistic settings. The test conditions that are conducted are sometimes derived from informant and descriptive methods and, therefore, are customized for each individual. That is, an experimental analysis can test for a variety of different potential maintaining variables depending on the individual case. In addition, experimental analyses can be conducted over time in extended (Vollmer, Marcus, Ringdahl, & Roane, 1995) or brief (Derby et al., 1992) formats.

Although originally developed for the assessment of self-injurious behavior of individuals with developmental disabilities, functional assessment methods have proven useful with a variety of RBs in individuals (primarily children) of typical intellectual functioning. Malatesta (1990) used an interview and subsequent experimental analyses to confirm a hypothesis that a father's presence was correlated with increased facial tics of a 9-year-old boy, suggesting a possible attention function. As mentioned earlier, Carr et al. (1996) demonstrated, with an experimental analysis, that the vocal tics of a 9-year-old typically developing boy were maintained by adult attention. Watson and Sterling (1998) used a descriptive assessment and brief experimental analysis to demonstrate that the coughing tic of a 4-year-old normally developing girl was maintained by attention. A subsequent intervention based on this finding was successful. Miltenberger et al. (1998) used several experimental analyses to confirm that the hair pulling of a 6-year-old typically developing girl was maintained by self-stimulation. Similarly, Ellingson et al. (2000) also used several experimental analyses to demonstrate that the finger sucking of two typically developing children (ages 7 and 10) was maintained by self-stimulation. Subsequent treatments based on these findings were successful. Finally, Rapp, Miltenberger, Galensky, Roberts et al. (1999) used similar methods that were effective with one of two 5-year-old fraternal twin brothers who engaged in thumb sucking. In addition to the aforementioned research on typically developing individuals, functional assessment methods have also been reported successful in evaluating the RBs of individuals with developmental disabilities (e.g., Miltenberger et al., 1998; Rapp, Dozier, Carr, Patel, & Enloe, 2000; Rapp, Miltenberger, Galensky, Ellingson et al., 1999).

As illustrated by the studies described above, the current literature suggests that reinforcement contingencies (perhaps in addition to certain biological variables) are capable of maintaining and/or exacerbating RBs. The strongest evidence supports attention and self-stimulation functions, primarily among children. However, this line of research has only recently

begun and other variables and populations have not yet been extensively studied.

## 4. ASSESSMENT OF SOCIAL CONCERNS

A number of recent investigations have suggested that individuals who engage in tics, hair pulling, and other RBs are viewed negatively by age-related peers. In a study of finger sucking by children, Friman, McPherson, Warzak, and Evans (1993) found that children who were photographed in a finger-sucking pose were rated as less desirable friends by age-related peers than when the same children were in non-finger-sucking poses. Long, Woods, Miltenberger, Fuqua, and Boudjouk (1999) evaluated social perceptions of individuals with mental retardation who engaged in hair pulling and fingernail biting. The authors videotaped actors who exhibited each of these behaviors during mock job interviews and then had undergraduate students rate the social acceptability of the applicant using the Social Acceptance Scale. The results indicated that individuals who engaged in hair pulling and fingernail biting were viewed as less acceptable by the students and were less likely to be hired than those who did not exhibit these behaviors. Similarly, Woods and colleagues have found that, as a group, individuals with motor tics, vocal tics, and hair pulling were viewed as less socially acceptable by college students (Woods, Fuqua, & Outman, 1999) and by adolescents (Boudjouk, Woods, Miltenberger, & Long, 2000) than individuals without these behaviors. Based on the collective results from these studies, it appears that the perception of RBs is an important factor to consider when assessing the pre-treatment severity of the behavior and determining the social validity (Wolf, 1978) of the treatment outcome.

In general, analogue evaluations of social perceptions of individuals who exhibit RBs suggest that they can affect one's social interactions. That is, if one is viewed as less attractive or less normal by others in his or her environment, this perception will likely result in fewer positive social interactions. Therefore, an intervention for an RB should be deemed efficacious only to the extent that it results in socially significant improvement. This improvement can be assessed in terms of either the social evaluation of the behavior itself (e.g., motor tics) or the product of the behavior (e.g., hair re-growth). To accomplish this type of assessment, videotaped segments of the individual's RB (e.g., tics, finger sucking) before and after treatment should be presented to "blind" observers (preferably age-equivalent peers). Likewise, for behaviors that result in visible products

(e.g., hair pulling, fingernail biting), pictures and videotaped segments of the regions from which hair pulling or nail biting occurs can be subjected to this same evaluation.

To evaluate changes in RBs or their products, observers should be provided with rating scales that they can respond to after viewing a sample of the RB. Questions should be developed to evaluate "how noticeable" and "how natural" the individual's behavior appears to the rater. For example, Woods, Miltenberger, and Lumley (1996) used three graduate and two undergraduate students to evaluate social perceptions of treatment outcomes for four children who exhibited chronic tics. Statistical analyses showed significant increases in social perception ratings for each child from pre- to post-treatment suggesting a substantial improvement in the social evaluation of these children. Similarly, Rapp, Miltenberger, Long et al. (1998) exemplified the use of social evaluation of response products by having four graduate students and three professors independently evaluate pre- and post-treatment photographs and still-frame videotapes of the scalps, eyebrows, and eyelashes of two children who engaged in hair pulling. Statistical analyses of these ratings indicated that both children appeared more natural, more normal, and less likely to have a "problem" one month following treatment (note that the passage of time is required for improvement in hair re-growth to be observable). In both of the above studies, documented behavior change, which was assessed via videotaped observation, was supported and further validated by changes in others' perceptions of the clients' RBs and/or appearances. Despite what appears to be very promising outcomes, these studies are somewhat limited in that age-equivalent peers were not used to evaluate social perceptions. In addition, the psychometric properties of some of the rating scales are unknown. In the future, researchers and clinicians should make every attempt to ensure that treatment outcomes can be socially evaluated in a manner that is most meaningful to the client given his or her specific characteristics.

## 5. ASSESSMENT OF OTHER PSYCHOLOGICAL CONDITIONS

In the assessment literature, there are number of psychological conditions that have been found in individuals who also display RBs. Using indirect assessment methods (e.g., the Child Behavior Checklist; Achenbach, 1991), Nolan, Sverd, Gadow, and Sprafkin (1996) found that the comorbid presence

of chronic tic disorder and attention-deficit/hyperactivity disorder (ADHD) was an indicator of complex psychopathology in children. Likewise, Koenig and Bornstein (1992) found that tic-disorder severity (as rated by parents) in boys was directly correlated with the extensiveness of psychological problems. Still, other RBs may be correlated with disorders of another classification. For example, individuals who engage in nocturnal bruxism (i.e., teeth grinding) may experience disturbances in sleep, which may lead to disorders of depression and anxiety (Ware & Morin, 1997).

Informal inspection of a number of single-subject treatment studies (e.g., Rapp, Miltenberger, Long et al., 1998; Woods et al., 1996) reveals that many of the participants are children diagnosed with ADHD. Although this may simply be reflective of a pattern for obtaining referrals (i.e., selection bias), clinicians should be aware of this potential correlation when conducting assessments. Conversely, the presence of an RB is not necessarily indicative of psychopathology. For example, Friman, Larzelere, and Finney (1994) found little evidence to suggest that childhood finger sucking was either a symptom or a correlate of psychopathology.

As a whole, it appears that individuals who exhibit RBs may experience other psychological problems. Currently, it is unclear why this correlation exists for some behaviors and not for others. It is speculated that genetic predisposition (especially with tic disorders), the behavioral function of the RB, as well as its developmental course, all are important factors in understanding these relationships. Our recommendation to clinicians who serve individuals who present with RBs is to make every effort to determine if there are covarying psychological problems that might (a) mediate the effects of treatment or (b) require treatment themselves.

## 6. CONCLUSION

In conclusion, a variety of behavioral assessment (i.e., indirect and direct methods) and functional assessment methods are often necessary to identify, define, and (through functional assessment) understand RBs to the extent that successful interventions can be designed and implemented. Because these assessment approaches include different methods that yield different results, it is possible to customize the pre-treatment assessment process for each client, depending on situational idiosyncrasies.

A contemporary issue that is relevant to tailored, idiographic assessment is the rise of managed behavioral healthcare. In today's managed-care environment, practitioners are increasingly held to the standards of

effectiveness and efficiency (Hayes, Barlow, & Nelson-Gray, 1999). Consequently, assessment methods that are both brief and psychometrically sound are needed. Interviews, rating scales, permanent-product measures, caregiver observation, self-monitoring, informant functional assessments, and brief experimental functional analyses, and perhaps some of the other methods described in this chapter, can all be implemented in a time-efficient manner. Clinicians are urged not to discard the assessment and evaluation process in an effort to save time. We believe that a more comprehensive understanding of our cases, which is only possible through sound behavioral assessment and functional assessment, is necessary for effective treatment selection.

## 7. REFERENCES

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4-18 and 1991 profile.* Burlington, VT: University of Vermont Department of Psychiatry.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Azrin, N. H., & Nunn, R. G. (1973). Habit reversal: A method of eliminating nervous habits and tics. *Behaviour Research and Therapy, 11*, 619-628.

Azrin, N. H., Nunn, R. G., & Frantz, S. E. (1980). Treatment of hairpulling (trichotillomania): A comparative study of habit reversal and negative practice training. *Journal of Behavior Therapy and Experimental Psychiatry, 11*, 13-20.

Bailey, J. S., & Pyles, D. A. M. (1989). Behavioral diagnostics. In E. Cipani (Ed.), *The treatment of severe behavior disorders: Behavior analysis approaches* (pp. 85-107). Washington, DC: American Association on Mental Retardation.

Billings, A. (1978). Self-monitoring in the treatment of tics: A single-subject analysis. *Journal of Behavior Therapy and Experimental Psychiatry, 9*, 339-342.

Bornstein, P. H., & Hamilton, S. B. (1978). Positive parental praise: Increasing reactivity and accuracy of self-observation. *Journal of Abnormal Child Psychology, 6*, 503-509.

Boudjouk, P. J., Woods, D. W., Miltenberger, R. G., & Long, E. S. (2000). Negative peer evaluation in adolescents: Effects of tic disorders and trichotillomania. *Child & Family Behavior Therapy, 22*, 17-28.

Carr, J. E., Taylor, C. C., Wallander, R. J., & Reiss, M. L., (1996). A functional-analytic approach to the diagnosis of a transient tic disorder. *Journal of Behavior Therapy and Experimental Psychiatry, 27*, 291-297.

Christenson, G. A., Mackenzie, T. B., Mitchell, J. E., & Callies, A. L. (1991). A placebo-controlled, double-blind crossover study of fluoxetine in trichotillomania. *American Journal of Psychiatry, 148*, 1566–1571.

Cohen, D. J., Leckman, J. F., & Shaywitz, B. A. (1985). The Tourette syndrome and other tics. In D. Shaffer, A. A. Ehrhardt, & L. Greenhill (Eds.), *The clinical guide to child psychiatry* (pp. 3-28). New York: Free Press.

Cooper, J. O., Heron, T. E., & Heward, W. L. (1987). *Applied behavior analysis*. Columbus, OH: Merrill.

Derby, K. M., Wacker, D. P., Sasso, G., Steege, M., Northup, J., & Cigrand, K. (1992). Brief functional assessment techniques to evaluate aberrant behavior in an outpatient setting: A summary of 79 cases. *Journal of Applied Behavior Analysis, 25*, 713-721.

Diefenbach, G. J., Reitman, D., & Williamson, D. A. (2000). Trichotillomania: A challenge to research and practice. *Clinical Psychology Review, 20*, 289-309.

Durand, V. M., & Crimmins, D. B. (1988). Identifying the variables maintaining self-injurious behavior. *Journal of Autism and Developmental Disorders, 18*, 99-117.

Ellingson, S. A., Miltenberger, R. G., Stricker, J. M., Garlinghouse, M. A., Roberts, J., Galensky, T. L., & Rapp, J. T. (2000). Analysis and treatment of finger sucking. *Journal of Applied Behavior Analysis, 33*, 41-52.

Elliott, A. J., & Fuqua, R. W. (2000). Trichotillomania: Conceptualization, measurement, and treatment. *Behavior Therapy, 31*, 529-545.

Friman, P. C., Larzelere, R., & Finney, J. W. (1994). Exploring the relationship between thumb-sucking and psychopathology. *Journal of Pediatric Psychology, 19*, 431-441.

Friman, P. C., McPherson, K. M., Warzak, W. J., & Evans, J. (1993). Influence of thumb sucking on peer social acceptance in first-grade children. *Pediatrics, 91*, 784-786.

Friman, P.C. (1990). Concurrent habits: What would Linus do with his blanket if his thumb-sucking were treated? *American Journal of Diseases of Children, 144*, 1316-1318.

Gaffney, G. R., Sieg, K., & Hellings, J. (1994). The MOVES: A self-rating scale for Tourette's syndrome. *Journal of Child & Adolescent Psychopharmacology, 4*, 269-280.

Harcherik, D. F., Leckman, J. F., Detlor, J., & Cohen, D. J. (1984). A new instrument for clinical studies of Tourette's syndrome. *Journal of the American Academy of Child Psychiatry, 23*, 153-160.

Hayes, S. C., Barlow, D. H., & Nelson-Gray, R. O. (1999). *The scientist practitioner: Research and accountability in the age of managed care* (2nd ed.). Boston: Allyn and Bacon.

Hughes, H., Hughes, A., & Dial, H. (1978). A behavioral seal: An apparatus alternative to behavioral observation of thumbsucking. *Behavior Research Methods & Instrumentation, 10*, 460-461.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27*, 197-209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2*, 3-20, 1982).

Iwata, B. A., Pace, G. M., Cowdery, G. E., Miltenberger, R. G. (1994). What makes extinction work: An analysis of procedural form and function. *Journal of Applied Behavior Analysis, 27*, 131-144.

Kahng, S., Iwata, B. A., Fischer, S. M., Page, T. J., Treadwell, K. R. H., Williams, D. E., & Smith, R. G. (1998). Temporal distributions of problem behavior based on scatter plot analysis. *Journal of Applied Behavior Analysis, 31*, 593-604.

Kahng, S. W., & Iwata, B. A. (1998). Computerized systems for collecting real-time observational data. *Journal of Applied Behavior Analysis, 31*, 253-261.

Kazdin, A. E. (1998). *Research design in clinical psychology* (3rd ed.). Boston: Allyn and Bacon.

Kelley, M. L., Heffer, R. W., Gresham, F. M., & Elliott, S. N. (1989). Development of a modified Treatment Evaluation Inventory. *Journal of Psychopathology and Behavioral Assessment, 11*, 235-247.

Keuthen, N. J., O'Sullivan, R. L., Ricciardi, J. N., Shera, D., Savage, C. R., Borgmann, A. S., Jenike, M. A., & Baer, L. (1995). The Massachusetts General Hospital (MGH) hairpulling scale: 1. Development and factor analyses. *Psychotherapy and Psychosomatics, 64*, 141–145.

Koenig, L. J., & Bornstein, R. A. (1992). Psychopathology in boys with Tourette syndrome: Effects of age on the relationship between psychological and physical symptoms. *Development & Psychopathology, 4*, 271-285.

Kompoliti, K., & Goetz, C. G. (1997). Clinical rating and quantitative assessment of tics. *Neurologic Clinics of North America, 15*, 239-254.

Leckman, J. F., Riddle, M. A., Hardin, M. T., Ort, S. I., Swartz, K. L., Stenvenson, J., & Cohen, D. J. (1989). The Yale Global Tic Severity Scale (YGTSS): Initial testing of a clinician-rated scale of tic severity. *Journal of the American Academy of Child & Adolescent Psychiatry, 28*, 566-573.

Lennox, D. B., & Miltenberger, R. G. (1989). Conducting a functional assessment of problem behavior in applied settings. *Journal of the Association for Persons with Severe Handicaps, 14*, 304-311.

Lerman, D. C., & Iwata, B. A. (1993). Descriptive and experimental analyses of variables maintaining self-injurious behavior. *Journal of Applied Behavior Analysis, 26*, 293-319.

Long, E. S., Woods, D. W., Miltenberger, R. G., Fuqua, R. W., & Boudjouk, P. J. (1999). Examining the social effects of habit behaviors exhibited by individuals with mental retardation. *Journal of Developmental and Physical Disabilities, 11*, 295-312.

Malatesta, V. J. (1990). Behavioral case formulation: An experimental assessment study of transient tic disorder. *Journal of Psychopathology and Behavioral Assessment, 12*, 219-232.

Miltenberger, R. G., Long, E. S., Rapp, J. T., Lumley, V., & Elliott, A. J. (1998). Evaluating the function of hair pulling: A preliminary investigation. *Behavior Therapy, 29*, 211-219.

Miltenberger, R. G., Rapp, J. T., & Long, E. S. (1999). A low-tech method for conducting real-time recording. *Journal of Applied Behavior Analysis, 32*, 119-120.

Nolan, E. E., Sverd, J., Gadow, K. D., & Sprafkin, J. (1996). Associated psychopathology in children with both ADHD and chronic tic disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*, 1622-1630.

Ollendick, T. H. (1981). Self-monitoring and self-administered overcorrection: The modification of nervous tics in children. *Behavior Modification, 5*, 75-84.

O'Neill, R. E., Horner, R. H., Albin, R. W., Sprague, J. R., Storey, K., & Newton, J. S. (1997). *Functional assessment and program development for problem behavior: A practical handbook (2nd ed.)*. Pacific Grove, CA: Brooks/Cole.

O'Sullivan, R. L., Keuthen, N. J., Hayday, C. F., Ricciardi, J. N., Buttolph, M. L., Jenike, M. A., & Baer, L. (1995). The Massachusetts General Hospital (MGH) hairpulling scale: 2. Reliability and validity. *Psychotherapy and Psychosomatics, 64*, 146–148.

Rapp, J. T., Carr, J. E., Miltenberger, R. G., Dozier, C. L., & Kellum, K. K. (in press). Using real-time recording to enhance the analysis of within-session functional analysis data. *Behavior Modification*.

Rapp, J. T., Dozier, C. L., Carr, J. E., Patel, M. R., & Enloe, K. A. (2000). Functional analysis of hair manipulation: A replication and extension. *Behavioral Interventions, 15,* 121-133.

Rapp, J. T., Miltenberger, R. G., Galensky, T. G., Ellingson, S. A., & Long, E. S. (1999). A functional analysis of hair pulling. *Journal of Applied Behavior Analysis, 32,* 329-337.

Rapp, J. T., Miltenberger, R. G., Galensky, T. L., Roberts, J., & Ellingson, S. (1999). Brief functional analysis and simplified habit reversal treatment of thumb sucking in fraternal twin brothers. *Child & Family Behavior Therapy, 21,* 1-17.

Rapp, J. T., Miltenberger, R. G., & Long, E. S. (1998). Augmenting simplified habit reversal with an awareness enhancement device: Preliminary findings. *Journal of Applied Behavior Analysis, 31,* 665-668.

Rapp, J. T., Miltenberger, R. G., Long, E. S., Elliott, A. J., & Lumley, V. A. (1998). Simplified habit reversal treatment for chronic hair pulling in three adolescents: A clinical replication with direct observation. *Journal of Applied Behavior Analysis, 31,* 299-302.

Repp, A. C., Felce, D., & Barton, L. E. (1988). Basing the treatment of stereotypic and self-injurious behaviors on hypotheses of their causes. *Journal of Applied Behavior Analysis, 21,* 281-289.

Shapiro, A. K., & Shapiro, E. (1984). Controlled study of pimozide vs. placebo in Tourette's syndrome. *Journal of the American Academy of Child Psychiatry, 23,* 161-173.

Stanley, M. A., Prather, R. C., Wagner, A. L., Davis, M. L., & Swann, A. C. (1993). Can the Yale-Brown Obsessive-Compulsive Scale be used to assess trichotillomania? A preliminary report. *Behaviour Research and Therapy, 31,* 171–177.

Sturmey, P. (1994). Assessing the functions of aberrant behaviors: A review of psychometric instruments. *Journal of Autism and Developmental Disorders, 24,* 293-304.

Swedo, S. E., Leonard, H. L, Rapoport, J. L., Lenane, M. C., Goldberger, E. L., & Cheslow, D. L. (1989). A double-blind comparison of clomipramine and desipramine in the treatment of trichotillomania (hair pulling). *The New England Journal of Medicine, 321,* 497–501.

Thomas, E. J., Abrams, K. S., & Johnson, J. B. (1971). Self-monitoring and reciprocal inhibition in the modification of multiple tics of Gilles de la Tourette's syndrome. *Journal of Behavior Therapy and Experimental Psychiatry, 2,* 159-171.

Touchette, P. E., MacDonald, R. F., & Langer, S. N. (1985). A scatter plot for identifying stimulus control of problem behavior. *Journal of Applied Behavior Analysis, 18,* 343-351.

Twohig, M. P., & Woods, D. W. (in press). Habit reversal as a treatment for chronic skin picking in typically developing adult male siblings. *Journal of Applied Behavior Analysis.*

Vollmer, T. R., Marcus, B. A., Ringdahl, J. E., & Roane, H. S. (1995). Progressing from brief assessments to extended experimental analyses in the evaluation of aberrant behavior. *Journal of Applied Behavior Analysis, 28,* 561-576.

Vollmer, T. R., & Smith, R. G. (1996). Some current themes in functional analysis research. *Research in Developmental Disabilities, 17,* 229-249.

Walkup, J. T., Rosenberg, L. A., Brown, J., & Singer, H. S. (1992). The validity of instruments measuring tic severity in Tourette's syndrome. *Journal of the American Academy of Child & Adolescent Psychiatry, 31,* 472-477.

Ware, J. C., & Morin, C. M. (1997). Sleep in depression and anxiety. In M. R. Preston & W. C. Orr (Eds.), *Understanding sleep: The evaluation and treatment of sleep disorders.*

*Application and practice in health psychology* (pp.483-503). Washington, DC: American Psychological Association.

Watson, T. S., & Sterling, H. E. (1998). Brief functional analysis and treatment of a vocal tic. *Journal of Applied Behavior Analysis, 31*, 471-474.

Winchel, R. M., Jones, J. S., Molcho, A., Parsons, B., Stanley, B., & Stanley, M. (1992). Rating the severity of trichotillomania: Methods and problems. *Psychopharmacology Bulletin, 28*, 457-462.

Wolf, M. M. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis, 11*, 203-214.

Woods, D. W., Fuqua, R. W., & Outman, R. C. (1999). Evaluating the social acceptability of persons with habit disorders: The effects of topography, frequency, and gender manipulation. *Journal of Psychopathology & Behavioral Assessment, 21*, 1-18.

Woods, D. W., Miltenberger, R. G., & Lumley, V. A. (1996). Sequential application of major habit-reversal components to treat motor tics in children. *Journal of Applied Behavior Analysis, 29*, 483-493.