Analogue Assessment of the Replacement Behavior

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The use of experimental analyses in determining behavioral function for problems behaviors is well established. Such analyses lead to functional treatment prescriptions for the target problem behavior. However, data indicative of the strength of the replacement behavior are often not collected during a functional behavioral assessment. I examine the utility of such data collection. I present analogue assessment methods for determining whether the replacement behavior is in the repertoire of the client, or needs to be shaped.

An experimental methodology for understanding why a behavior problem occurs, in terms of environmental functions, has received extensive attention and development (Bailey & Pyles, 1989; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982; Iwata, Vollmer, & Zarcone, 1990; Lalli, Browder, Mace, & Brown, 1993; Lerman & Iwata, 1993; Lennox & Miltenberger, 1989; Lerman & Iwata, 1993, Mazelski, Iwata, Vollmer, Zarcone, & Smith, 1993). The efficacy of using functional analysis of behavior paradigms (AKA analogue assessment) to discern consequent controlling variables has received extensive empirical support since the original study in 1982 (Iwata, et.al., 1982). A functional analysis of problem behavior empirically extracts the context conditions under which such a behavior becomes more probable. Its heightened rate can be explained by both the presenting motivational conditions as well as the utility of such a behavior to produce a stimulus change that addresses the client's motivational condition. Cipani & Schock (2007) have designated sub-categories within four major environmental functions, in their classification system (see Table 1).

Table 1: Four Environmental Functions

Socially mediated positive reinforcement	Direct positive reinforcement
Socially mediated negative reinforcement	Direct negative reinforcement

This function-based diagnostic classification system classifies problem behaviors according to their environmental function. Operant behaviors are maintained by either positive or negative reinforcement operations. The manner in which the reinforcers are produced can be either socially mediated (i.e., through the behavior of another) or directly (behavior produces reinforcer). For example, a child throws tantrums in the afternoon before dinner. Such behaviors reliably result in

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access to food items, under conditions of relative deprivation, by her parent eventually giving the child a small snack. Tantrum behavior resulted in access to snack (positive reinforcement operation), but the result was mediated by her parent (i.e., socially mediated behavior problem or SMA 2.3: access to tangible reinforcers in diagnostic system). Snack items could be obtained by another child under similar motivating conditions by coming home and grabbing some cookies when parent is not watching (i.e., pilfering the cookie jar). The operation is the same, but the manner in which the reinforcer was obtained was not socially mediated. Rather it was directly produced via the chain of behaviors referred to as pilfering.

While much is known about why a problem behavior occurs at an unacceptable rate, little to date has been done with developing a methodology to discern why the rate (or lack thereof) of the alternate behavior is relatively low. What would be the utility of such an analysis? An experimental analysis of the problem behavior allows the user to design functional interventions that address the controlling variables of that behavior. The same result could also be achieved from an experimental analysis of the contextual variables of the alternate replacement behavior.

Such an analysis could lead to the design of effective interventions prior to any "false starts." Consider the following hypothetical example. A client in a residential facility is referred for a functional behavioral assessment for engaging in self-injury. Reports from staff and descriptive data seem to indicate that this behavior is maintained as a result of socially mediated escape from unpleasant social situations (see Cipani & Schock, 2007). When other client's get near him when he is playing with his preferred toy, he screams and begins hitting himself. Such behavior usually brings staff, with the result of being separated from other clients.

To test this hypothesis of a socially mediated escape function experimentally, an analogue

assessment is set up. In a contrived setting, two test conditions will be implemented in a multi-element design: (1) client is in therapy room with other clients with his preferred toys and (2) client is in room with other clients without his preferred toys. The escape contingency for self-injury will be the same under both test conditions, i.e., the client will be removed from the room. If this analogue assessment identifies that a client's self-injury is significantly higher in the condition where the motivational condition is present (client in room with toy), then this hypothesis is confirmed. Let us say that the data reveals that this client's self-injury functions as socially mediated escape from unpleasant social situations. When the client has preferred toys in his possession, the additional presence of peers generates the motivational conditions for escape.

With this experimentally verified hypothesis regarding the escape function of self-injury under specific motivational conditions, two derived treatment contingencies should be imposed. First, the contingency plan should involve the discontinuance of the staff socially mediating escape from such a context when this client engages in self-injury (thereby disabling this function). Second, an alternate appropriate replacement behavior should be designated and enabled with such an escape function. While it is clear that extinction of the currently functional self injury is required, what treatment regimen is needed to increase the designated alternate behavior? Specifically, what design features are necessary to produce an acceptable rate of the replacement behavior? The conduct of the analogue assessment on the target behavior does not contribute to an understanding of the replacement behavior's existing strength and controlling variables. What level of reinforcement contingencies and instructional methods are needed? An assessment that derives the controlling variable for the replacement behavior is needed to provide an empirically derived answer.

Too often, delineation of the strategy for increasing the replacement behavior becomes pure speculation. For example, many FAB forms ask the respondent: "How will you teach the replacement behavior?" This makes an assumption that the replacement behavior needs to be taught! Is that always the case when a behavior occurs infrequently (or not at all)? Suppose the

hypothetical individual with self-injury is perfectly capable of performing an alternate behavior under the relevant motivational conditions, e.g., yelling out, "Help, he's about to take my toy." However, such a response, once performed, leads to the staff response; "Well, don't just stand there, get up and walk away from him." This client's mand to these staff often proves ineffective in protecting his toy from the intruder. Hence the replacement behavior does not occur in that context, not because the client is unable to perform such behavior. Rather the differential effectiveness of self-injury versus the alternate appropriate mand in this social environment dictates the more probable response.

A low (or non-existent) rate of the replacement behavior during the initial assessment can translate to several different possibilities. Does the replacement behavior need to be taught/developed? Or will a simple re-arrangement of functional contingencies be sufficient to increase this behavior? An analogue assessment involving the controlling variables of the replacement behavior may lead to an answer. Cipani & Schock (2007) have identified three diagnostic categories that can be used to classify the replacement behavior's current strength during an initial assessment. They are: (1) misdirected contingency problems, (2) inept repertoire problems, and (3) faulty discrimination problems.

Misdirected Contingency Problems

The basic nature of this diagnostic category is the misdirected reinforcement contingencies for both the problem and replacement behaviors. The low rate of replacement behavior is due to the concurrent schedule of reinforcement for both sets of behavior. The following hypothetical scenario illustrates a child who can request nicely from his mother a box of cookies while in the grocery store (see Table 2). However, such a request goes unheeded.

Table 2: Scenario of Misdirected Contingencies dDagnosis

Child: "Mommy, can I have the box of cookies."

Mother: (not wanting to fulfill that request, ignores it)

Child: "I asked if I can have the cookies, please?"

Mom: tells the child, "No cookies today!"

Child: "But I really want the cookies." (begins crying)

Mom: "I don't want you to eat too many cookies. Don't you think that you should stop eating as many cookies as you do? They are bad for your diet."

Child: "I don't eat that many." (continuing to cry).

Mom: (begins moving away from cookies)

Child: (Cries and falls on the floor)

Mom: "Get up. You are making a spectacle of yourself. If you will be good, I will get one box after I get the chicken for dinner."

Child: (gets up and gradually stops sobbing while holding onto the shopping cart)

What just happened? The child asks nicely, but is told that she is not getting cookies. An acceptable behavior did occur, yet, it was not as effective (from the child's viewpoint) in getting cookies as the tantrums. Then the child begins crying and screaming for the cookies. The mother continues to explain why she cannot get cookies for her daughter today. After several minutes of the child's tirade with the mother's retorts, the mother gives the child the cookies (to terminate the tantrum when she falls to the floor of the grocery store). We can all see that the tantrum serves a socially mediated access function. We would expect tantrums to become more probable and requesting nicely less probable (and profitable), given these "misdirected" contingencies.

Problems with a low level of replacement behavior in this diagnostic category can be simply addressed by re-arranging contingencies in favor of a more acceptable replacement behavior. Shifting the schedule of reinforcement with either positive or negative reinforcement contingencies will be effective in changing the rate of the replacement behavior. The schedule of reinforcement becomes denser for the replacement behavior, while the schedule for the target behavior is eliminated, or drastically reduced to a factor lower than that for the replacement behavior. With behaviors functioning to access a positive reinforcer, the occurrence of the replacement behavior is scheduled to produce a higher rate of the specific reinforcer than the problem behavior. In the case of negative reinforcement, removal of the aversive event is contingent upon the occurrence of the replacement behavior. Concurrently, the problem behavior's relationship to escape is eliminated (if at all possible). Simple contingency management techniques involving differential reinforcement, token economies, and/or behavioral contracts can be utilized with this diagnostic category.

Inept Repertoire Diagnosis
An inept repertoire can exist because the client cannot perform the target replacement behavior, or cannot perform it fluently. Many children and adult clients, particularly individuals with severe disabilities, often engage in the problem behavior because of the lack of alternate appropriate behaviors in their repertoire. Aberrant behaviors such as self-abuse, tantrums, and aggression often fill the void and eventually result in the delivery of the desired reinforcer.

Incorrect diagnosis of inept repertoire problems as misdirected contingency problems can have disastrous results. A client aggresses against teaching personnel under conditions of excessive demands or requests. This client may not be capable of communicating to the staff person that he does not understand the task (task difficulty is motivational condition), or that he feels the number of demands are excessive (task length is motivational condition). Staff may assume he "knows" how to communicate his needs (seeing it as a misdirected contingency problem). They just attribute his aggressive behavior to being "spoiled." Hence effective instruction to develop alternate behaviors is not rendered and the client continues to engage in escape behaviors that are undesirable (with a very lean schedule of reinforcement for such).

In some cases, a client may be able to perform the replacement behavior but not fluently. In this circumstance, an inept repertoire is still relevant. For example, a child who uses his fingers to add, subtract, multiply and divide may be able to come up with a correct answer, but he will need more time to complete an assignment. Hence simply placing a reinforcement contingency on completion may do little good. One can only go so fast on your fingers! Teaching this child to memorize the facts would prove beneficial.

The treatment implications for a diagnosis of an inept repertoire problem are considerable. Unlike misdirected contingencies problems, merely manipulating reinforcement contingencies for the replacement behavior is insufficient. The practitioner needs to design shaping components into the behavioral intervention, both in terms of developing the response, or chain of responses, in addition to increasing the frequency of behavior. Of course, differential reinforcement is required, but steps must be taken to build the behavior. Strategies that teach the client how to perform the appropriate behavior(s) are necessary.

Faulty Discrimination Problems
This diagnostic category can involve a set of data that can mimic a misdirected contingency problem.

The test to discern this type of problem would illustrate that the low frequency of replacement behavior is dependent on the conditions. If the rate of the replacement behavior is variable across different contexts, then a failure to generalize is the problem. For example, a child performs an appropriate request for a reinforcer with one teacher but not with her parents (or any one else). With heightened rates of behavior under one or a few stimulus conditions, it is apparent the behavior does produce reinforcement under those conditions.

These problems are treated with generalization strategies, whereby the behavior is transferred to new settings, people or time. A systematic approach to programming for generalization needs to occur. Reinforcement of the behavior when it does occur in the new target settings or conditions will certainly be a part of the program. However, the design of the behavioral intervention for the replacement behavior will involve methods to generalize the behavior from its current antecedent conditions to new conditions.

Purpose of an Analogue Assessment for the Replacement Behavior

If the rate of the replacement behavior is low and not a result of a faulty discrimination problem, can one automatically assume that the diagnosis for the replacement behavior would be inept repertoire? An analogue test may be needed to discern which of the first two diagnostic categories is operable in a given case. Does the replacement behavior represent a misdirected diagnostic classification or an inept repertoire diagnosis? The questions that need to be answered by an analogue assessment of the replacement behavior are the following: First, is the replacement behavior in the repertoire of client, but not reinforced in natural context(s)? Second, is the replacement behavior not in the repertoire of the client and does not occur within any given context?

What are the implications for intervention efforts in determining the diagnostic category for the replacement behavior? If the replacement behavior constitutes a misdirected contingencies diagnosis, then one need not teach the behavior. Simply re-arranging the contingencies heavily in favor of the replacement behavior (i.e., enable its function) over the target behavior (disable its ability to produce desired function) will be effective. However, if the replacement behavior and or its

pre-requisites are not in the repertoire of the client, then shaping, prompting, stimulus fading and direct instruction are probably needed. An analogue assessment of the replacement behavior answers these questions. Such an effort be a necessity prior to intervention for clients whose behavior problems have had a history of unsuccessful treatment efforts.

Designing an Analogue Experimental Manipulation

How does one set up an assessment that determines whether the behavior is in the repertoire of the client? The brief answer: A test of differential reinforcement contingencies, using the identified functional reinforcer for two different behaviors (two test conditions). The analogue test would have the following experimental design and test conditions (see Table 3). A dense reinforcement schedule for replacement behavior is contrived in one condition. This is preceded by a control condition where a dense schedule of reinforcement for target behavior occurrence is instituted. The experimental design could be an alternating treatments design (Barlow & Hayes, 1979; Cooper, Heron & Heward, 2007, pgs 188-197; Iwata, et al., 1982).. Data must be collected on both behaviors under both test conditions.

Table 3: Basic Elements of an Analogue Test for Replacement behavior

Two test conditions, implement after analogue assessment for target behavior

Identified Functional Replacement Behavior

Motivational variables must be maximized!

Data collected on replacement and target behaviors

One test condition; functional reinforcer is contingent on target behavior occurrence (control condition)

Use of alternating treatments design

Other test condition: functional reinforcer is contingent upon replacement behavior (experimental condition)

What will the data show? First, your hypothesis about the function of the target behavior needs to be accurate. Given sufficient motivational conditions, providing the functional reinforcer contingently will obviously increase the behavior that produces it in a given test condition. Therefore, alternating the behavior that produces it, in two test conditions, will demonstrate a change in the level of those behaviors upon the contingency. If the replacement behavior is in the repertoire of the client, than one would observe an increase in its frequency when its function is made to produce the reinforcer in Phase B, while the

target behavior decreases in frequency due to extinction (see Table 4).

Table 4: Data Revealing a Misdirected Contingency Diagnosis

	Phase A: Reinforce target behavior	Phase B: reinforce replacement behavior
Target behavior frequency	high	low
Replacement behavior frequency	low	high

The following example illustrates the data that would be obtained with an analogue assessment of the replacement behavior, if a mis-directed contingency diagnosis is correct. A hypothetical four year old child engages in high rates of self-injury during the school day. The behavioral consultant conducts an analogue assessment7.of the target problem behavior (Iwata, et al., 1981), using an alternating treatment design. The results reveal that self injury serves an attention function. Therefore the target objectives for this child are the following: (1) decrease self-injury under motivational conditions of relative deprivation of adult attention and (2) increase an alternate attention getting behavior, such as "look at me," under those same antecedent conditions. With an analogue assessment of the target behavior, the antecedent motivative and discriminative conditions for the self-injury are known. What is not known is the strength of the alternate behavior that should replace the function of self-injury. The behavioral consultant initiates an experimental analysis of the replacement behavior. Table 4 depicts the two phases of this analysis, where the functional reinforcer is manipulated as a consequence for either the self-injury or the designated replacement behavior. What would the data reveal from such an analysis if the child is capable of performing the alternate behavior? The response, " Look at me, " would be at low rates during phase A where self-injury is made to produce adult attention on a continuous schedule. However, in Phase B, if a mis-directed contingency diagnosis is correct, the rates of behavior will switch. The therapist would prompt

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[7] If an analogue assessment of the target behavior has not been performed, than a stimulus preference assessment using approach as the measure of preference (DeLeon & Iwata, 1996) or a measure of stimulus engagement (DeLeon, Iwata, Connors, & Wallace, 1999) is needed.

the alternate behavior a few times as well as deliver the functional reinforcer, i.e. attention, when the alternate behavior is performed. As a result, "look at me," as a behavior increases in frequency. Concurrently, the removal of attention for self-injury results in a dramatic and quick drop in this behavior in Phase B. What these two phases of an analogue test demonstrate is that both behaviors are in the repertoire of this child and can be easily brought under control of the schedule of reinforcement.

So why did this child engage in self-injury in his classroom instead of accessing attention in a more appropriate form. Perhaps saying "Look at me," does not result in adult attention as quickly as hitting oneself in the classroom. Perhaps self-injury produces attention every single time. Calling out, "Look at me, results in attention only after a significant amount of time elapses. Perhaps both conditions are existent. But the data from this experimental analysis indicates that an appropriate form is in the repertoire of this child, and only requires a more dense schedule of reinfocer delivery.

If the replacement behavior is not in the repertoire of the client, than the effect of the change in differential reinforcement procedures in Phase B would be telling (see Table 5). One would not observe an increase in the frequency of the replacement behavior when the functional reinforcer is provided for it in Phase B. Phase B would also see possibly some residual level of target behavior, in spite of extinction procedures. This would be due to the failure of any response to produce reinforcement in this analogue test (i.e., extinction burst). The child who engages in self-injury (depicted earlier) would not show an increase in the alternate behavior, Look at me, " in phase B. This analysis reveals that the alternate behavior needs to be taught directly, possibly using a discrete trials format with incidental teaching procedures. Teaching staff may need to do more than just wait for the alternate behavior to occur and reinforce it! Table 5 illustrates the data set representing an inept repertoire diagnosis.

Table 5: Data Revealing an Inept Repertoire Diagnosis

	Phase A: Reinforce target behavior	Phase B: reinforce replacement behavior
Target behavior frequency	high	More frequent than replacement behavior
Replacement behavior frequency	Very low or non-existent	Very low or non-existent

Summary

The use of an experimental analysis in determining the nature of the replacement behavior has value, particularly in clinical situations where treatment failure has preceded the current effort. A behavior analyst can more adequately design the treatment plan and contingencies for the replacement behavior from an analogue test of the designated replacement behavior's current strength. If analogue assessment data indicate that such a behavior is already in the repertoire of the client, then simply arranging the functional reinforcer to be delivered in favor of the replacement behavior should produce the desired effect. However, an inept repertoire would probably not be effectively treated in such a manner. Such a diagnosis would require additional instructional features of the treatment program to build such a behavior initially. An analogue test of the replacement behavior can provide more convincing evidence for a diagnosis of the replacement behavior.

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