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## Identifying the Function of Aberrant Behavior: Comparing Variations of the Experimental Functional Analysis

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**IDENTIFYING THE FUNCTION OF ABERRANT BEHAVIOR:  
COMPARING VARIATIONS OF THE EXPERIMENTAL  
FUNCTIONAL ANALYSIS**

**by**

**Kathryn M. Potoczak**

**A Dissertation  
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Faculty of The Graduate College  
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**Western Michigan University  
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# **IDENTIFYING THE FUNCTION OF ABERRANT BEHAVIOR: COMPARING VARIATIONS OF THE EXPERIMENTAL FUNCTIONAL ANALYSIS**

**Kathryn M. Potoczak, Ph.D.**

**Western Michigan University, 2003**

**The advent of the experimental functional analysis has had a significant effect on the field of behavior analysis in shifting the focus from topography-based interventions for aberrant behavior to treatment based on function. The original method developed by Iwata, Dorsey, Slifer, Bauman, and Richman in 1982 utilized attention, demand, alone, and play conditions in a multielement design. Its effectiveness in determining the function of aberrant behavior using both antecedents and corresponding contingencies of reinforcement is well established, and it is the most prevalent method of functional assessment used today.**

**However, an alternative to the Iwata et al. (1982) procedure exists. This is the experimental functional analysis developed by Carr and Durand (1985), in which the experimental conditions (easy 33, difficult 100, and easy 100) are designed to generate aberrant behavior by utilizing varying levels of attention and demand as establishing operations (EOs). No consequences are provided for any aberrant behavior in this method, making this procedure conceptually different from the Iwata et al. procedure, and laying the groundwork for a comparison of the two methods in terms of effectiveness in identifying the function of aberrant behavior.**

The results of this comparison indicate that the Iwata method is significantly more effective in identifying behavioral function than the Carr and Durand (1985) method (100% differentiation versus 20%, respectively). This is probably most likely due to the different rationales upon which each method is based; recent research has found that EO manipulations alone are much less reliable in the identification of behavioral function than the combination of EO/consequence manipulations. An interesting finding is that the Carr and Durand method seemed less effective in situations of aberrant behavior maintained by escape from demands; it may be the case that participants are unable to discriminate between easy and difficult tasks in this procedure (any demand serves as an EO for aberrant behavior, regardless of the difficulty of the task).

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Kathryn M. Potoczak

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## CHAPTER I

### INTRODUCTION

One of the most important changes in the field of applied behavior analysis in the last 20 years has been the shift in focus from the topography of behavior to its function when considering treatment options. Historically, treatments have been chosen primarily because of the match between a particular intervention and the topography of the relevant aberrant behavior targeted for deceleration (Carr, Coriaty, & Dozier, 2000). This focus on topography led to the development of the Least Restrictive Alternative (LRA) model for treating aberrant behavior; intrusive interventions such as punishment were only to be implemented after less intrusive interventions had been attempted (Carr et al.).

The need for the LRA model was due, in part, to the focus on topography rather than function. When the relevant maintaining variables are ignored in the choice of treatment, it is more likely that treatment will fail. Reinforcement contingencies that provide a non-functional consequence rely merely on the transient strength of a particular reinforcer. Therefore, under the LRA model, punishment takes on a default role, and may, in fact, have been used more often than if the function of the aberrant behavior had been identified (Carr et al., 2000).

The historical focus on topography in treatment choice is somewhat at odds with the conceptual and theoretical focus of behavior analysis, which has been

primarily concerned with the function of behavior (Mace, 1994). Operant paradigms hold that both adaptive and aberrant behavior are learned through interactions between an individual and the environment; the primary focus of behavior analysis is to identify the maintaining consequences and the contingencies of which they are a part. Nonetheless, this focus on function has historically been neglected in applied arenas, resulting in a reliance on the potency of reinforcers and an overreliance on default technologies such as aversive stimulation (Mace).

The advent of functional analysis technology in the early 1980s, however, resulted in a paradigm shift in applied behavior analysis from topography to function in the choice of interventions for aberrant behavior (Carr et al., 2000). This paradigm shift has had many positive outcomes, such as the ability to identify more effective interventions (Horner, 1994), resulting in the decreased relevance of the LRA model (Carr et al.) and a decreased need for the use of aversive interventions (Mace, 1994). Another positive outcome is the fulfillment of the tenets for effective behavioral treatment, as proposed by Van Houten et al. (1988). Further, this paradigm shift represents a return to our historical roots in terms of an analysis of behavior, and strengthens the link between basic and applied research (Mace).

### **The Origin of the Experimental Functional Analysis**

The impetus for the development of the technology now known as experimental functional analysis originated in a seminal article by Carr published in 1977. This article examined the "motivation" for self-injurious behavior (SIB), or

more specifically, discussed five hypotheses concerning the maintaining variables of such behavior. These hypotheses were the positive reinforcement hypothesis, the negative reinforcement hypothesis, the self-stimulation hypothesis, the organic hypothesis, and the psychodynamic hypothesis.

Both the positive reinforcement hypothesis and the negative reinforcement hypothesis held that SIB can be a learned operant, maintained either by social positive reinforcement delivered contingent upon the occurrence of the behavior (positive reinforcement hypothesis) or by termination or avoidance of an aversive stimulus, such as an academic demand, following the occurrence of SIB (negative reinforcement hypothesis). Carr presented empirical evidence that supported the role of both of these types of contingencies in the maintenance of SIB.

The third of the hypotheses, the self-stimulatory hypothesis, held that an organism needs a certain level of stimulation, especially in the tactile, vestibular, and kinesthetic modalities. When this stimulation is lacking, an organism may engage in self-stimulation, including SIB, as a means of providing this sensory stimulation. Evidence from research conducted in institutional settings, such as psychiatric hospitals and orphanages, indicated that SIB is more likely in places where there is little stimulation. When toys or activities were added to these settings, SIB and other self-stimulatory behaviors decreased. Carr did warn, however, of the propensity to use this explanation in a default manner, when another explanation for SIB was not available, and of the methodological difficulties inherent in research involving what is



now known as automatically reinforced behavior, issues which are still grappled with 25 years later.

The organic hypothesis proposed that SIB resulted from an organism's aberrant physiology, involving either a life-long genetic abnormality, such as Lesch-Nyhan syndrome, or a temporary condition, such as otitis media. However, in many of the cited studies proposing an organic cause for SIB, operant therapy was successful in reducing or eliminating the behavior. Based on this, Carr found it unlikely that SIB could be explained as simply the product of aberrant physiological processes.

The last hypothesis, the psychodynamic hypothesis, is really not a single hypothesis, but many different hypotheses from the same school of thought. One theory posited that some individuals have difficulty distinguishing the self from the real world, and that SIB is generated as an attempt to establish "body reality." Yet another discussed the possibility that SIB arises from the necessity to alleviate guilt. Carr notes the now well-known facts about such hypotheses; constructs such as guilt and body reality are nearly impossible to operationalize, and little or no empirical evidence exists to either support or refute such theories.

Therefore, the maintaining operant hypotheses for SIB discussed in Carr's 1977 article can be reduced to three. Organic causes for SIB, such as otitis media, are ruled out first, before behavioral intervention is undertaken. The psychodynamic theories, whose inclusion in Carr's discussion date his work, are not relevant to an analysis of behavior. The three remaining hypotheses, social positive reinforcement,

social negative reinforcement, and self-stimulation, constitute the foundation for the experimental functional analyses examined in the remainder of this paper.

### **The Experimental Function Analysis of Iwata and Colleagues**

The original experimental functional analysis method was devised to determine the function of SIB, due to the mixed results attained using topography-based interventions for this often severe aberrant behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). The analogue experimental conditions were arranged to determine if SIB was maintained by social positive reinforcement, social negative reinforcement, or automatic reinforcement, as these consequences were thought to differentially affect the occurrence of SIB, a direct result of Carr's (1977) analysis. Four conditions were developed to assess function in a multielement design, in which each participant was exposed to the four conditions in random order twice a day. The three test conditions were social disapproval, academic demand, and alone, designed to test social positive, social negative, and automatic reinforcement functions, respectively. The fourth condition, unstructured play, was used as a control condition.

In the social disapproval condition, the therapy room was supplied with a variety of toys. At the start of the session, the subject was instructed by the experimenter to "play with the toys" while the experimenter "does some work." If SIB occurred, the experimenter delivered contingent attention in the form of statements of concern and disapproval, often paired with brief physical contact, such

as a hand on the shoulder. All other responses were ignored. The increase of SIB during this condition indicated that it was maintained at least in part by social positive reinforcement.

In the academic demand condition, educational activities that were appropriate but difficult for each subject were used to investigate the maintaining role of social negative reinforcement, or in other words, SIB reinforced by contingent escape from academic tasks. A graduated, three-prompt procedure was used to present learning trials to the subject, involving an initial verbal instruction, then a repeated instruction and modeling, and finally, physical guidance if the task was not completed with instruction and modeling alone. Social praise was delivered upon task completion whether physical guidance was necessary or not. Upon the occurrence of SIB, learning trials were immediately terminated for 30 s. In addition, a change-over delay of 30 s was implemented for repeated self-injury.

In the alone condition, the child was placed in the therapy room alone, with no access to toys or other materials. All sources of external stimulation were removed from the child from a social standpoint; SIB that occurred in this condition could not be maintained by social consequences, and thus, by default, might be serving an automatic reinforcement function.

The unstructured play condition was instituted as a control for the other three experimental conditions, in that attention was delivered every 30 s contingent upon appropriate behavior (control for social disapproval), no academic demands were delivered (control for escape from demands), and toys were readily available in

addition to frequent experimenter contact (control for the alone condition in terms of an enriched environment). Further, SIB was ignored unless its severity required session termination.

The four-condition sessions were conducted until one of three following criteria were met: (1) levels of SIB became stable, (2) unstable levels of SIB were recorded in all conditions for 5 days, or (3) 24 four-condition sessions were run. In six of nine participants (67%), higher levels of SIB were consistently associated with one of the experimental conditions, thus possibly pinpointing the function of these subjects' SIB.

However, as noted by Iwata and colleagues (1982/1994) in the discussion of their procedure, confidence in the accuracy of these findings would have been greatly increased by implementing a contingency reversal for each subject. For example, evidence of a suspected social negative reinforcement function provided in the four-condition experimental analysis could be strengthened by a contingency reversal. In this condition, escape would be eliminated as a consequence for SIB (tasks would continue when SIB occurred). Reduction of SIB in this condition would provide confirmatory evidence that the true maintaining function was indeed social negative reinforcement.

Regardless of this limitation, this procedure for identifying the behavioral function of SIB was the first of its kind. It would come to be known as the experimental functional analysis, and would result in a substantial improvement in our ability to determine the maintaining variables of aberrant behavior (LeBlanc,

Patel, & Carr, 2000). In addition, once these variables have been identified, treatments can be designed to change these maintaining contingencies, and thus, the potential for effective treatment is greatly enhanced.

Due to this effectiveness, the experimental functional analysis devised by Iwata and colleagues has become the prevalent means for rigorous functional assessment used not only by behavior analysts but by school psychologists and others. It has been studied extensively for two decades, including its application to other aberrant behaviors such as pica (Goh, Iwata, Kahng, 1999; Piazza et al., 1998), hair pulling (Rapp, Miltenberger, Galensky, Ellingson, & Long, 1999), bizarre speech (Mace & Lalli, 1991), and eye poking (Kennedy & Souza, 1995), to name a few. It has been utilized in outpatients clinics in an abbreviated form (Derby et al., 1992; Northup et al., 1991; Wacker et al., 1994) and in schools (Northup et al., 1994; Repp, 1994; Taylor & Romanczyk, 1994). In fact, it has been recommended as a "best practice" by the National Institutes of Health since 1989, and was mandated for use in schools by IDEA legislation in 1997.

The success of the Iwata method is due to its defining features, which were denoted in the original study (Iwata et al., 1982/1994) and have been utilized in some form in all subsequent studies of this method (e.g., Fischer, Iwata, & Worsdell, 1997; Kahng & Iwata, 1998; Worsdell, Iwata, Conners, Kahng, & Thompson, 2000). Worsdell et al. refer to these defining features as the antecedent-behavior-consequence (A-B-C) model. Specifically, test conditions in the Iwata method for a given behavioral function contain the manipulation of both an establishing operation

(EO, which is an antecedent) and a reinforcement contingency (consequence) for an aberrant behavior. For example, in the social disapproval condition, an experimenter withholds attention as an antecedent event but delivers it contingent on the occurrence of the aberrant behavior. Conversely, during the unstructured play condition, or the control condition, both the EO and reinforcement are absent; attention is delivered non-contingently on a 30 s fixed-time (FT) schedule (EO absent) and attention is not delivered contingent upon the aberrant behavior (reinforcement absent).

Though this basic A-B-C model is always used in the Iwata method, researchers have sought to refine this method since its advent in 1982. New test conditions have been devised as needed, such as the tangible condition, in which the participant is deprived of a tangible object, be it a food item or toy (EO present), and aberrant behavior results in the presentation of or a timed amount of access to the tangible (reinforcement). Recently, McCord, Iwata, Galensky, Ellingson, and Thomson (2001), devised test conditions to test for aberrant behavior evoked by noises of differing source and intensity.

Other researchers have examined the importance of the EO component of the A-B-C model to the effectiveness of the functional analysis. Fischer et al. (1997) found that unambiguous functional analysis outcomes were more likely to be obtained when test conditions contained both an EO and a reinforcement contingency versus a consequence alone. Further research by Worsdell et al. (2000) supported this finding; their results indicated that high rates of aberrant behavior were observed only

in the test condition in which both the EO and the reinforcement contingency were present.

Kahng and Iwata (1998) also examined the role of EOs in their research, with a different purpose. They tested the possibility of using the alone condition as a control in place of the unstructured play condition in cases of escape behavior, as the presence of the experimenter in the play condition may serve as an EO for demands, resulting in increased aberrant behavior in the play condition. Their results supported this hypothesis, indicating that it may be feasible to use the alone condition as a more-suitable control for escape-maintained behaviors.

Although there is no doubt that the advent of the Iwata method of experimental functional analysis revolutionized the field of applied behavior analysis, it does have some limitations. First, it can be a lengthy process in the original multielement format (Sturmey, 1995). In light of this limitation, researchers have developed brief analyses for use in applied settings with the success rate of the original format by reducing the duration of sessions (Wallace & Iwata, 1999), checking the correspondence between the outcomes of brief and extended analyses (Kahng & Iwata, 1999), and even by developing a progression to determine when a brief analysis is appropriate (Vollmer, Marcus, Ringdahl, & Roane, 1995).

A further limitation of the procedure is that it is not perfect; the success rate of unambiguous differentiation is about 85% (Kahng & Iwata, 1999; Vollmer et al., 1995). Still other researchers have sought to improve this success rate by utilizing discriminative stimuli such as different colored rooms to improve discrimination

between the test conditions (Conners et al., 2000), and also by conducting a stimulus preference assessment pre-analysis to ensure toys utilized during attention, tangible, and unstructured play conditions are truly preferred (Lalli & Kates, 1998). In addition, Hagopian et al. (1997) have developed structured criteria to aid in the interpretation of the data gathered from functional analyses, with the hopes of clearing up ambiguity.

Further, an alternative to the Iwata method of functional analysis exists. This is another type of functional experimental analysis, developed in 1985 by Carr and Durand, to aid in the reduction of aberrant behavior. This method, in contrast to the method used by Iwata and colleagues (1982/1994), does not utilize consequences to aid in the identification of the variables maintaining aberrant behavior. Instead, it simply relies on EOs to evoke behavior; an increase in the aberrant behavior in the presence of a particular EO indicates the maintaining consequence, though this consequence is never directly applied to the behavior in question.

#### **The Experimental Functional Analysis of Carr and Durand**

Developed in an educational context, the experimental functional analysis of Carr and Durand (1985) was designed to assess classroom situations in which aberrant behavior reliably occurs. According to these researchers, aberrant behavior in the classroom is maintained by two broad classes of consequences: attention and escape. Thus, the goal of their study was to pinpoint whether the aberrant behavior in question was attention-seeking behavior or escape behavior; this analysis was then



used to select appropriate replacement behavior to teach to the students that would achieve the relevant consequences.

An initial assessment was conducted with each of the four participants in the study to determine which academic tasks were easy and which were difficult. A receptive labeling task using picture cards from the Peabody Picture Vocabulary Test was conducted with each child. This identified 20 cards that were easy for the child to label receptively (100% correct) and 20 cards that were identified at no better than chance levels (25% correct). These cards were then utilized in the appropriate experimental conditions.

The three experimental conditions consisted of varying levels of task difficulty and adult attention designed to assess maintaining variables. The baseline condition was "easy 100," in which the academic task was easy and attention was given in 100% of the intervals. This condition then served as a comparison condition for the other two experimental conditions. The child worked on an academic task that had been assessed at the outset to be easy for them to complete. This task, presented every 30 s, consisted of receptive labeling or match-to-sample using the 20 easy picture cards from the Peabody Picture Vocabulary Test. Each type of task (receptive labeling or match-to-sample) was used during 50% of the experimental sessions.

In terms of the delivery of attention, the 30 s presentation intervals were further broken down into 10 s intervals. Attention in the form of mands (e.g., "Point to the \_\_\_\_\_" on the receptive labeling task, and "Match this" on the match-to-sample task), praise for correct responses or working on the task, and a variety of

descriptive statements (e.g., "It's a nice day.") was given every 10 s, as indicated by a prerecorded tape of cues used with a bug-in-the-ear device that delivered a beep. If a child made an error during the match-to-sample or receptive labeling task, the experimenter would say "No!" and go on to the next trial.

In the "easy 33" condition, the child worked on the same easy academic task as utilized in the easy 100 condition. However, attention was now given in only 33% of the 10 s intervals, or every 30 s, and descriptive statements were discontinued. Now, mands and praise were given within the same 10 s interval, rather than in different intervals as had been the case in the easy 100 condition. This resulted in an overall decrease in attention from 100% to 33% (one interval out of three included attention). During the other intervals, the experimenter worked with another child seated at the table, ignoring the target child.

In the "difficult 100" condition, the child was directed to receptively label or match-to-sample the 20 picture cards from the Peabody Picture Vocabulary Test that had been earlier assessed as difficult. Attention in the form of mands, praise (usually for continuing to work, due to the difficulty of the task), and descriptive statements was given every 10 s as described in the easy 100 condition. As in the easy 100 condition, errors resulted in "No!" and the initiation of a new trial.

The experimenter ignored all aberrant behavior except under two circumstances. If the child left his or her seat, the experimenter allowed 10 s for the child to return, and then lead the child back to his or her seat without comment. Further, if the aberrant behavior exhibited posed a physical risk to the child or

experimenter, the experimenter would restrain the child for 5-10 s while continuing with the task at hand. This procedure was used during all experimental conditions.

All conditions were 10 minutes in length (randomly sequenced in groupings of three), and the frequency of the aberrant behavior was continuously recorded in 10 s intervals. If higher rates of aberrant behavior occurred in the easy 33 condition than in the other two conditions, the indicated maintaining consequence was attention.

Conversely, if higher rates of aberrant behavior occurred in the difficult 100 condition than in the other two conditions, the indicated maintaining consequence was escape from academic demands. Interventions in the form of functional communication training (i. e., asking for help or attention instead of engaging in SIB or tantrums) showed that the analysis procedure had indeed pinpointed the maintaining consequences correctly in four developmentally disabled children.

The defining feature of the Carr and Durand experimental functional analysis is that it adopts an antecedent-behavior (A-B) model for determining maintaining variables. Antecedents in the form of EOs are varied across test conditions, but consequences are not (Worsdell et al., 2000). For example, in the easy 33 condition, which is designed to examine a social positive reinforcement function for aberrant behavior, easy tasks are presented, and attention is delivered in 33% of the experimental intervals. In the control condition, termed "easy 100", easy tasks are presented and attention is delivered in 100% of the experimental intervals. No differential consequences for the aberrant behavior are presented in either condition; it is simply an EO manipulation, with the conditions differing solely in terms of

attention deprivation (67% deprivation in the easy 33 condition versus no deprivation in the easy 100 condition).

Therefore, all experimental conditions are conducted under extinction in the Carr and Durand method, and it would seem that this functional analysis is based on extinction bursts. In other words, in the easy 33 condition, the participant is attention-deprived as compared to the easy 100 condition. Then, when the aberrant behavior occurs, it is not reinforced. The conditions of deprivation and extinction, if the behavior in question is maintained by social positive reinforcement, should combine initially to produce a high rate of aberrant behavior in the easy 33 condition, but not in the easy 100 condition, where there is no deprivation. It is an assumption within this method that the extinction burst is indeed a salient feature of behavior under these conditions; this may or may not be the case. Lerman and Iwata (1996) report that extinction bursts may not be as salient as once thought, occurring in only 24% of 113 sets of extinction data examined.

Regardless, the Carr and Durand method of experimental functional analysis has been cited a handful of times in the research literature (Durand & Carr, 1987, 1991, 1992; Durand & Crimmins, 1987, 1988), with the procedure differing very little from that utilized in the original 1985 study. These studies indicate a rate of successful differentiation of maintaining variables as good if not better than Iwata's (Carr & Durand, 1985; Durand & Carr, 1987). The most recent study was one conducted by Meyer in 1999. The same three test conditions were used (easy 33, difficult 100, and easy 100), with the addition of another condition, difficult 33, in

which tasks presented are difficult for the participant and attention is provided in only 33% of the experimental intervals. This would serve as a control condition in contrast with easy 100, as sort of a "double deprivation" condition. The results of the Meyer study indicate unambiguous differentiation in four out of four participants, though this finding is based on the subsequent acquisition of functional communication based on the findings of the functional analysis.

### **A Comparison of the Two Methods**

When comparing the Iwata et al. (1982/1994) procedure with the Carr and Durand procedure (1985) of experimental functional analysis, several differences come to light. The most obvious of these is the way in which each analysis approaches the identification of the variables maintaining aberrant behavior; the defining features of each method are distinctly different. The Iwata et al. procedure adopts the A-B-C model, in which both antecedents and consequents are manipulated during test conditions to determine the cause of the aberrant behavior in question (Worsdell et al., 2000). The Carr and Durand procedure, in contrast, adopts the A-B model, in which only antecedents are manipulated, and aberrant behavior is under extinction, or does not result in reinforcement. This method relies on an extinction burst during the relevant condition of deprivation to indicate differentiation.

Another obvious difference between these two methods is the lack of a condition to assess automatically reinforced aberrant behavior in the Carr and Durand procedure. In the Iwata et al. procedure, the alone condition is used to assess whether

SIB will occur in an austere environment (an institution) where no social attention is possible and no demands are made, thus indicating that the aberrant behavior in question is reinforcing in itself. This difference is most likely due to the fact that while Iwata et al. conducted their research in a psychiatric inpatient setting, Carr and Durand conducted their analysis in a classroom setting in which social consequences were the most likely maintaining variables of other types of aberrant behavior, such as tantrums and aggression.

Another difference between the two methods is the degree to which each has been used and has resulted in the generation of further research. While the Carr and Durand procedure has been utilized relatively few times, the prevalence of the Iwata method in both practice and research is substantial. This may be due in part to the model (A-B-C versus A-B) that each method adopts. New test conditions focusing on both antecedents and consequents have been created to examine more idiosyncratic variables in the Iwata method, resulting in a procedure that is perhaps more easily customized for a particular client than the more restricted, antecedent-only manipulation of Carr and Durand.

In addition, current refinements to the Iwata method include the use of discriminative stimuli to aid in the differentiation of test conditions, as well as the addition of reinforcer assessment procedures to improve the quality of the conditions utilized. These types of adjustments have not been attempted with the Carr and Durand method; this again may be due to the missing "C" in the model it adopts, which makes it difficult to refine.

## The Purpose of the Study

The method of experimental functional analysis devised by Iwata et al. (1982/1994) is prevalent, and has benefited from much research to both expand and refine its test conditions. The Carr and Durand (1985) method of experimental functional analysis is not prevalent, having been used in relatively few studies, and its current use is nearly identical to its original delineation. However, each method relies on a different behavioral process to infer behavioral function, and according to the research literature, each is quite effective in the differentiation of maintaining variables. Therefore, a comparison is in order.

The purpose of this study is to directly compare the Iwata procedure using the most recent refinements available (the inclusion of discriminative stimuli and reinforcer assessment procedures) with the Carr and Durand procedure. The benefits of this comparison include further support for the effectiveness of the Iwata method as it has evolved, as well as evidence that the Carr and Durand method can hold its own in terms of successful differentiation. Because it is based on extinction rather than the delivery of consequences contingent on the occurrence of the aberrant behavior, examination of the Carr and Durand procedure will also provide interesting information about the prevalence of the extinction burst, in addition to information about the utility of antecedent manipulation alone, versus that of antecedent and consequent combined. Further, since the Carr and Durand procedure does not involve the delivery of consequences, if it is as effective as prior studies have indicated, its

use may palatable in some instances, as the aberrant behavior is allowed to occur, but is not directly reinforced, as it is in the Iwata method.



## CHAPTER II

### METHOD

#### Participants

Five participants were used in the study. These participants were drawn from two different classrooms in a small, rural school in the Upper Peninsula. The classrooms were designated as educable mentally impaired (EMI) and trainable mentally impaired (TMI). All of these classrooms were special education classrooms, and were staffed by special education teachers and a number of paraprofessionals, depending upon the number of students in the classroom.

Students must be certified for services by the school psychologist to be included in one of the two aforementioned classrooms. The certification for placement in an EMI classroom is accomplished by a treatment team that includes but is not limited to a school psychologist, a speech pathologist, a social worker, and the student's parent/guardian. The three criteria derived by the state of Michigan are: (1) a score on a standardized IQ test that is two to three standard deviations below the mean, (2) a score on standardized reading and math tests that is at or below the lowest 6<sup>th</sup> percentile, and (3) adaptive behavioral impairment, as evidenced by the Vineland Adaptive Behavior Scales or another measure of adaptive behavior. The third

criterion is widely construed, and may involve deficits in areas such as social skills, daily living skills, or the presence of aberrant behavior.

State placement criteria for the TMI classroom are similar to the criteria for the EMI classroom; however, the exclusion of achievement test scores (reading and math) rightly indicates that these students have more severe impairments than those placed in the EMI classroom. The two criteria for placement in an TMI classroom are (1) a score on a standardized IQ test that is three to four-and-a-half standard deviations below the mean, and (2) adaptive behavioral impairment, as evidenced by the Vineland Adaptive Behavior Scales or another measure of adaptive behavior. Again, the adaptive behavior criterion is widely construed, and placement eligibility for a TMI classroom is usually determined by a treatment team.

Initially, based on the recommendation of the Human Subjects Institutional Review Board (HSIRB), the parents/guardians of all students in both classrooms were sent a letter to invite them to participate in the study ( $n = 31$ ). Then, all parents/guardians were contacted to determine if they were willing to have their dependent participate in the study. Of the 30 families contacted (one family did not have a phone, and thus, the experimenter excluded them on this basis), 24 were willing to have their dependent participate. At this time, the experimenter met with the classroom teachers and the school psychologist to gather information about which students of these 24 exhibited frequent problem behavior and would benefit from inclusion in the study. Next, the experimenter directly observed the eligible students in each classroom, and chose 11 students for further screening.

The next phase of participant selection was conducted in one of three meeting rooms in the school based on availability. Each of these rooms contained only a table, chairs, and the video camera used to record experimental data in addition to the materials used by the experimenter. First, the experimenter ran abbreviated sessions of either the Iwata or Carr and Durand experimental functional analysis (the method was chosen at random) to determine the frequency of problem behavior, and whether it occurred reliably enough to warrant inclusion. This resulted in the exclusion of 4 of the students, whom, in the experimenter's judgement, did not exhibit frequent enough aberrant behavior under experimental conditions to warrant inclusion.

Of the seven remaining students, it was suspected that the aberrant behavior of one was maintained by automatic reinforcement. This student was instructed to "sit quietly" while the experimenter "went to get something." The experimenter remained gone from the room for 10 minutes while the video camera recorded data. The videotape did indeed indicate a high frequency of the behavior in question, indicating that it was most likely maintained by automatic reinforcement, thus excluding this student from the study. Finally, one other student would not allow himself to be videotaped, and became agitated when the camera was turned on. He instructed the experimenter to turn off the camera, and surreptitious attempts to turn the camera on were detected. Thus, this student was also excluded, and the remaining five students, described next, were those utilized in the study.

Ursula, Darryl, and Dexter were participants drawn from the EMI classroom. Ursula was a 9-year-old female with Down syndrome who had a one-to-one aide at

the time the study was conducted. Darryl was a 7-year-old male with a diagnosis of autism. Dexter was a 9-year-old male with a diagnosis of attention-deficit hyperactivity disorder (ADHD) who was taking prescribed Ritalin.

Larry and Howie were participants drawn from the TMI classroom. Larry was an 8-year-old male with an EMI classification who was placed in the TMI classroom so that he would have the opportunity to learn daily living skills (the EMI classroom's focus was more academic). The school psychologist suspected a diagnosis of autism would be appropriate, but this had yet to be assigned. Larry had also been formerly placed in an emotionally-impaired (EI) classroom due to behavior problems. Howie was a 17-year-old male with a diagnosis of ADHD who was taking prescribed Ritalin.

No prerequisite skills were necessary for participation in the study. The only requirement for inclusion in the study was the exhibition of aberrant behavior on a regular basis that could be operationally defined and reliably observed. The aforementioned screening process guaranteed that the behaviors were frequent enough to be reliably observed, and also that they were maintained by social variables rather than automatic reinforcement. Participants met with the experimenter for 30 minutes on 20 separate occasions, each meeting consisting of three 10-minute-long test conditions.

Informed consent was obtained from the guardians of all participants, as well as from the participants themselves when this was possible. This included an explanation of the experimental procedures, the purpose and goals of the study, and a

description of any potential risks involved in participation, as well as potential benefits. Participants were also informed that they could withdraw from the study at any time without penalty.

### Setting

The experiment took place in one of three meeting rooms in the school depending on availability. Each of these rooms contained only a table, chairs, and the video camera used to record experimental data in addition to the materials used by the experimenter.

### Dependent Variable

The dependent variable in this study was the effectiveness of each method in reliably identifying the probable maintaining consequence for a particular operationally defined aberrant behavior. "Reliably identified" was defined by the criteria devised by Hagopian et al. (1997). Based on the idea that visual data analysis can be somewhat subjective, especially when results are not obvious, Hagopian and colleagues (among them Iwata) developed standardized criteria for the visual analysis of the findings of experimental functional analyses. These criteria were created by exposing experts to several data sets from actual functional analyses conducted using the Iwata method, and then basing the criteria for differentiation on expert consensus.

The Hagopian et al. (1997) analysis requires that there be 10 data points plotted for each experimental condition (which was the rationale for conducting 10 three-condition sessions of each method in the current study). Two criterion lines are

drawn at approximately one standard deviation above and below the mean of the control condition (play in the Iwata method and easy 100 in the Carr and Durand method). Generally, the upper criterion line is drawn between the second and third highest data points in the control condition, while the lower criterion line is drawn between the second and third lowest points in the control condition. Differentiation is based on the number of data points in each experimental condition that fall beyond the criterion lines, and is said to occur when at least five more data points from a test condition fall above the upper criterion line than fall below the lower criterion line. (When the lower criterion line is zero, each zero point is counted as below the lower criterion line.)

In the Iwata et al. (1982/1994) method the three conditions utilized included the attention, demand, and play conditions (the alone condition was not used, as this study examined only aberrant behaviors maintained by social variables, and participants were excluded during initial screening on the basis of a high rate of aberrant behavior during a 10-minute alone condition), and the comparable easy 33, difficult 100, and easy 100 conditions in the Carr and Durand method.

The dependent variable was assessed by analyzing data recorded by video camera during the experimental sessions. These videotapes were reviewed and scored by the experimenter in terms of occurrence and nonoccurrence of the aberrant behavior in question during continuous 10 s intervals in a partial interval recording procedure. Interval changeovers were signaled by a cassette tape containing pre-recorded prompts, and actual recording was accomplished with a standardized form

and pencil. These responses and the conditions in which they occurred formed the basis for conclusions reached about the effectiveness of the two methods in pinpointing the maintaining variables for the participants' aberrant behavior.

Each participant was exposed to each method in counterbalanced order, and the conditions were randomized within groups of three. An experimental session was 30 minutes long and consisted of the presentation of the three-condition grouping for either method. For each method, 10 sessions were conducted, as required by Hagopian et al. (1997) for the analysis of the data using their standardized criteria. Data analysis resulted in either the delineation of a differentiated maintaining condition or a finding of "undifferentiated." If the results were ambiguous, or if no one condition was identified as maintaining the aberrant behavior in question, this was reported. A percentage of effectiveness was calculated for each method by dividing the number of clearly differentiated participants by the total number of participants in the study.

### **Independent Variable**

The independent variable in this experiment was the type of experimental functional analysis employed to determine the cause of the aberrant behavior. Two types of functional analyses were utilized: the Iwata method and the Carr and Durand method. Each participant was exposed to both methods, and counterbalancing was used to prevent the undue influence of sequence effects.

The Iwata method consisted of the attention, demand, and play conditions, randomized within groups of three, with each condition lasting 10 minutes. In the attention condition, the meeting room was supplied with a variety of age-appropriate medium- preference toys (as determined by a prior preference assessment). Upon the start of the condition, the participant was instructed by the experimenter to “play with the toys” while the experimenter “does some work.” If the aberrant behavior occurred, the experimenter delivered contingent attention in the form of statements of concern and disapproval, often paired with brief physical contact, such as a hand on the shoulder. All other responses were ignored.

In the demand condition, educational activities that were appropriate but difficult for each participant (as indicated by the classroom teacher and a prior task assessment) were used in a graduated, three-prompt procedure to present learning trials to the participant. This procedure involved an initial verbal instruction, then a repeated instruction and modeling, and finally, physical guidance if the task was not completed with instruction and modeling alone. Social praise was delivered upon task completion whether physical guidance was necessary or not. Upon the occurrence of the aberrant behavior, learning trials were immediately terminated for 30 s.

The play condition served as a control for the other two experimental conditions, in that attention was delivered every 30 s contingent upon appropriate behavior (control for the attention condition), and no academic demands were delivered (control for the demand condition). In addition, high-preference, age-



appropriate toys (also determined by the prior preference assessment) were available in addition to frequent experimenter contact, and aberrant behavior was ignored.

The Carr and Durand method also consisted of randomized groups of three 10-minute-long conditions, but these conditions were easy 33, difficult 100, and easy 100. Academic tasks used in these conditions were chosen based on the recommendations of the classroom teacher and a task assessment conducted before the beginning of the experiment. In the easy 33 condition, the participant was given an easy academic task and received attention from the experimenter during only 33% of the 10 s intervals into which the 10-minute condition was divided (every 30 s). The difficult 100 condition consisted of a difficult academic task and attention from the experimenter for 100% of the 10 s intervals within the condition. The control condition was the easy 100 condition, in that the task was easy and attention was given in 100% of the 10 s intervals within the condition; this was the condition with which the other two conditions were then compared.

### **Experimental Design**

This study utilized an alternating-treatments design embedded within an A-B design. The clear identification of the maintaining variable(s) for each participant for each method was determined by using the aforementioned Hagopian et al. (1997) criteria. The effectiveness of each method was compared within the individual participants.

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Before any experimental sessions commenced, an initial consultation took place with both the school psychologist and the classroom teachers. This helped to pinpoint students exhibiting pervasive classroom behavior problems that could be better dealt with if the maintaining consequence was identified. Upon the designation of several possible participants, direct observations within the classrooms were undertaken, to determine the extent of the aberrant behavior and the probability that it could be operationally defined and reliably recorded, and the screening process continued as described under the heading "Participants" earlier in this section.

#### Operational Definition of Target Behaviors

As soon as the five participants were identified and informed consent was obtained from parents/guardians and the participants themselves, where applicable, operational definitions were established for the aberrant behavior of each participant based on further direct observation within the classroom. Generally, the aberrant behavior for each participant can be entitled "noncompliance," though this entailed different behaviors for each participant. Ursula's noncompliance was defined as a refusal to reply or participate, denoted by closing her eyes and/or putting her head down on the table. Dexter's noncompliance was defined as out-of-seat behavior, talking when told to be quiet, and touching the test materials or experimenter. Howie's non-compliant behaviors consisted of grabbing/destroying test materials, refusing to reply by ignoring the experimenter, and out-of-seat behavior. Darryl's noncompliance consisted of the behaviors of grabbing/destroying test materials and

leaving his seat. Larry's noncompliance was exhibited by his refusal to reply by either turning in his seat or saying, "No!" as well as by out-of-seat behavior.

### Task Assessment

After the target aberrant behaviors had been operationally defined, the classroom teacher of each participant was interviewed in order to gain information about the academic level of the participants, as well as what types of tasks would most likely be "easy" and "difficult" for each participant. Using this information, the experimenter engaged each participant in a task assessment session, in which different tasks were presented to the participants. Easy tasks were those that the participants could complete correctly nearly 100% of the time, while difficult tasks were those that the participants could complete correctly with no better than chance probability (if four cards were presented in a task, then the percentage of correct trials should be no more than 25%). For all five of the participants, the receptive identification of animals as well as letters of the alphabet using flash cards ("Point to the bear." or "Point to the letter A.") were found to be easy tasks.

Difficult tasks for all participants were addition problems presented on flash cards ("Point to the one that equals eleven.") Therefore, the easy tasks were used in the easy 33 and easy 100 of the Carr and Durand method, while the difficult tasks were used in the demand condition of the Iwata method and the difficult 100 condition of the Carr and Durand method.

### Preference Assessment

The next step was to identify objects/toys to be used in the attention and play conditions of the Iwata method. Based on teacher recommendations, items from the classroom as well as those purchased by the experimenter were chosen for each participant. Participants were then subjected to a brief multiple-stimulus without replacement (MSWO) preference assessment in the meeting room, in which an array of eight stimuli were placed in front of the participant and he/she was directed to "Pick one." This first selection was determined to be the most preferred stimulus. The participant was allowed to play with the object for approximately 30 s, and then the item was removed. The participant was then instructed to "Pick one." from the remaining seven items. In this way, it was determined which stimuli were high preference (the first two chosen), medium preference (the next three) and low preference (the last three). The medium preference stimuli for each participant were used in the attention condition of the Iwata method, while the highly preferred stimuli were used in the play (control) condition.

### Experimental Sessions

At this time, the experimental sessions began. Materials needed for the experimental sessions were in place when the student entered the meeting room. This included three colored tablecloths (red, white, and blue) that were used to aid discrimination between experimental conditions. The first participant was exposed to the Iwata method first, while the second participant started with the Carr and Durand

method, and so on. Participants underwent one 30-minute session a day, with each session consisting of the respective random order three 10-minute condition grouping, depending on the method being examined. When ten sessions were conducted with one method, the participant then underwent ten sessions of the other method to which they had not yet been exposed.

### Interobserver Agreement

Two independent undergraduate student observers scored responses during at least 30% of the experimental sessions (with a range for individual participants of 24% to 38%). Reliability percentages for occurrence and nonoccurrence of responses were calculated on an interval-by-interval basis by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

Occurrence agreement for Ursula (96.8%), Dexter (92.8%), Howie (93.2%), Darryl (98.4%), and Larry (95.6%) averaged 95.4% for all participants. Nonoccurrence agreement for Ursula (92.7%), Dexter (96%), Howie (91.5%), Darryl (93.2%), and Larry (95.2%) averaged 93.7% for all participants.

### Treatment Integrity

In any comparative study, it is important to ensure that the methods being compared are indeed being administered to participants as designed, or the comparison is flawed. As the video camera that recorded data in this experiment was positioned to record both the behavior of the participant as well as the behavior of the

experimenter, it was relatively easy to gather data to ensure treatment integrity. In the Iwata method, the experimenter's behavior subjected to analysis was the timely delivery of reinforcement contingent on the occurrence of the target behavior during the attention and demand conditions. The particular reinforcer delivered depended on the condition in effect at the time of the analysis. For example, in the attention condition, upon the occurrence of the target behavior, the experimenter should express verbal statements of concern and also possibly touch the participant. In the demand condition, the experimenter should stop the presentation of tasks and remove task materials from the table for 30 s after an occurrence of the target behavior.

In the Carr and Durand method, no reinforcement contingencies are in effect during experimental conditions and all aberrant behavior is ignored. Therefore, it is not possible to evaluate treatment integrity in the same manner as it was examined in the Iwata method. Instead, the accuracy of presentation in terms of attention was examined. In the difficult 100 condition, attention in the form of statements to the participant should occur every 10 s (100% of the 10 s intervals). Conversely, in the easy 33 condition, attention should only be delivered in 33% of the 10 s intervals (only every 30 s).

Once the behaviors of interest of the experimenter in terms of treatment integrity were established, 32% of the experimental videotapes were scored by two independent undergraduate observers to determine if treatment integrity was indeed maintained in the study. Reliability percentages were calculated in a similar fashion to that for interobserver agreement for the Iwata method. For example, in the

attention condition, the delivery of contingent attention was scored on an interval-by-interval basis as occurring or not occurring. Then, this data was compared interval-by-interval to the previously recorded data on occurrence and nonoccurrence of the target behavior to determine in which intervals the provision of attention was appropriate (an interval in which a target behavior had occurred or the subsequent interval) or inappropriate (an interval in which no target behavior had occurred). Treatment integrity percentages were calculated on an interval-by-interval basis by dividing the number of intervals in which reinforcement was appropriate by the number of intervals in which reinforcement was appropriate plus those where it was not and multiplying by 100. For the attention condition of the Iwata method, treatment integrity was calculated to be 100%.

Similarly, in the demand condition of the Iwata method, the same procedure was adopted, but the behavior of interest of the experimenter was the cessation of task presentation and removal of task material contingent on the occurrence of the target behavior. Again, after the experimenter's behavior was recorded, it was compared interval-by-interval to previously recorded data on the occurrence and nonoccurrence of the target behavior to determine in which intervals the cessation of task presentation was appropriate (an interval in which a target behavior had occurred, or the subsequent interval) or inappropriate (an interval in which no target behavior had occurred), and then the aforementioned formula was applied. Again, the correspondence between the occurrence of the target behavior and the appropriateness of reinforcement was 100%.

With reference to the Carr and Durand method, delivery of non-contingent attention (integrity of the conditions themselves in terms of attention) was scored on an interval-by-interval basis by two independent undergraduate observers as occurring or not occurring. For the difficult 100 condition, delivery of attention should have occurred in every interval, or every 10 s, while in the easy 33 condition, it should have been delivered in every third interval (every 30 s). Treatment integrity was calculated by simply counting the number of intervals in which attention was delivered. To establish treatment integrity, in the difficult 100 condition, there should have been 60 intervals in which attention was delivered (all 10 s intervals of the 10-minute condition); in the easy 33 condition, there should have been only 20 instances of attention delivery (one-third of the 10 s intervals of the 10-minute condition). When these instances were counted and averaged across the conditions that were scored, and then divided by 60 (difficult 100) or 20 (easy 33) it was found that treatment integrity was 98% for the difficult 100 condition, and 94% for the easy 33 condition.



## CHAPTER III

### RESULTS

The results of the experiment for each of the five participants are presented on the five subsequent graphs. A two-part graph was constructed for each participant, with the number of experimental sessions on the abscissa and the percent of experimental intervals in which aberrant behavior occurred on the ordinate. To facilitate ease in comparison, the first section of each graph will present data from the Iwata method, while the second part will present data from the Carr and Durand method (though the presentation of the methods was counterbalanced across participants). These graphs served as the foundation for the later application of the Hagopian et al. (1997) criteria for determining if unambiguous differentiation of the cause of the aberrant behavior in question had occurred, and thus, as the basis for the comparative effectiveness of each method.

Initial visual examination of these graphs indicates that the application of the Iwata method resulted in the delineation of an unambiguous maintaining variable for all five participants. Ursula, Howie, Darryl, and Larry all demonstrated markedly higher percentages of aberrant behavior during the demand condition versus the attention and play conditions. Dexter exhibited a higher percentage of aberrant behavior during the attention condition than during the demand or play conditions.

The findings are more difficult to classify visually with regard to the Carr and Durand method. Ursula exhibited a low percentage of aberrant behavior across all three experimental conditions, while Howie, Darryl, and Larry exhibited just the opposite (relatively high rates of aberrant behavior across all three experimental conditions). A clear maintaining variable is not indicated from the visual analysis of this data for these four participants; the application of standardized criteria to this data is necessary in order to evaluate whether any determination of causality can be made. For Dexter, the Carr and Durand method seems to indicate that attention is the variable maintaining aberrant behavior, as a markedly higher percentage of this behavior occurred during the easy 33 condition than during either the difficult 100 or easy 100 conditions.

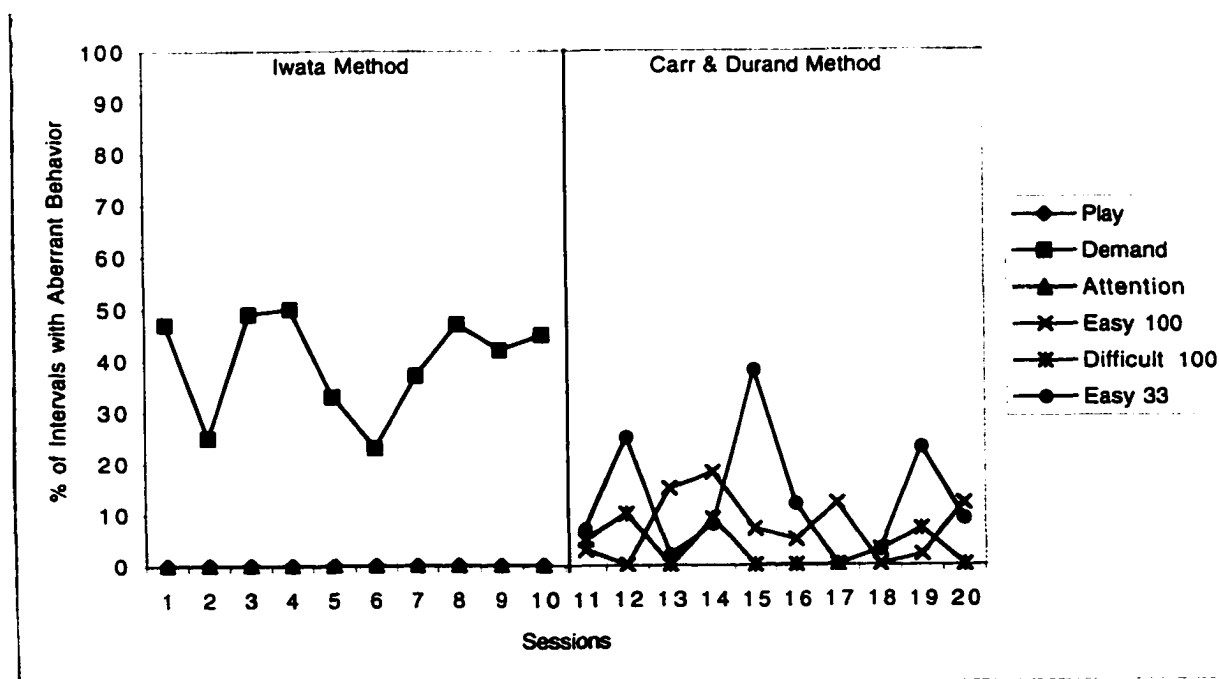


Figure 1. Experimental Functional Analyses for Ursula.

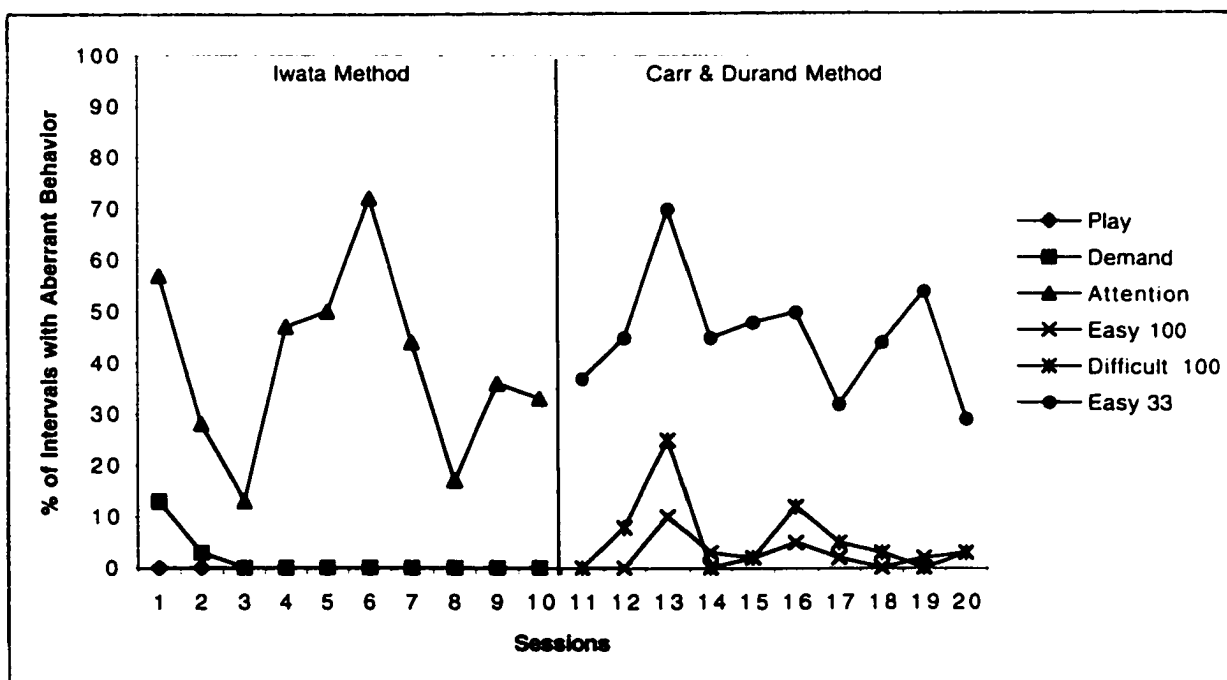


Figure 2. Experimental Functional Analyses for Dexter.

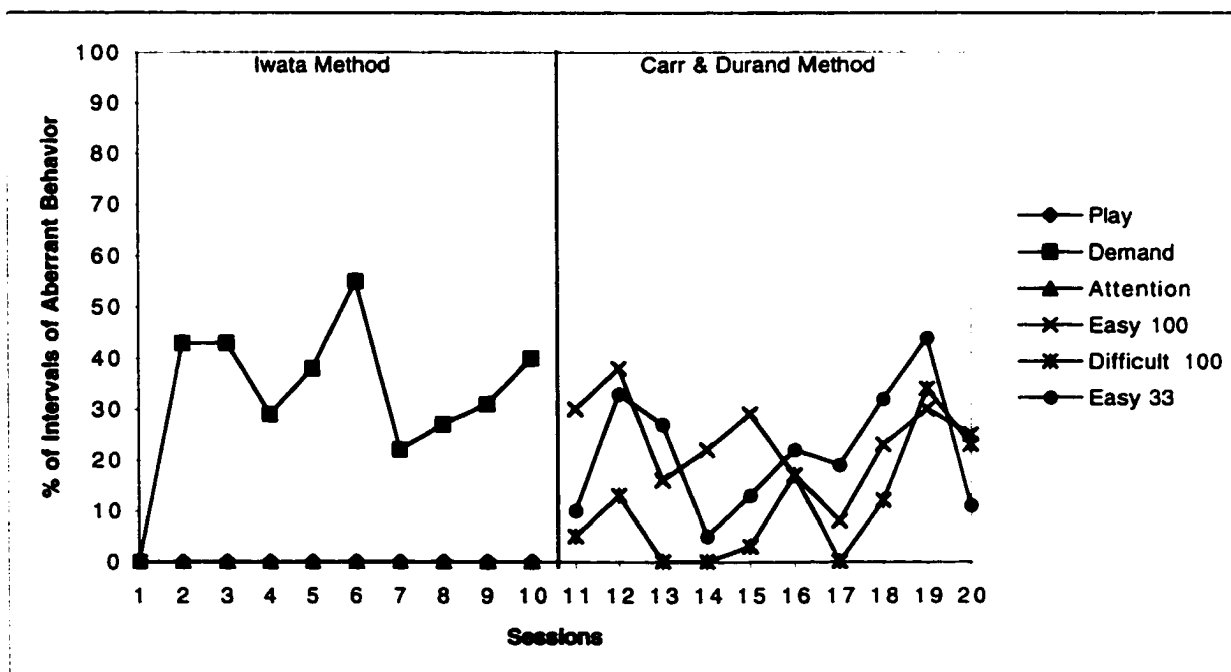


Figure 3. Experimental Functional Analyses for Howie.

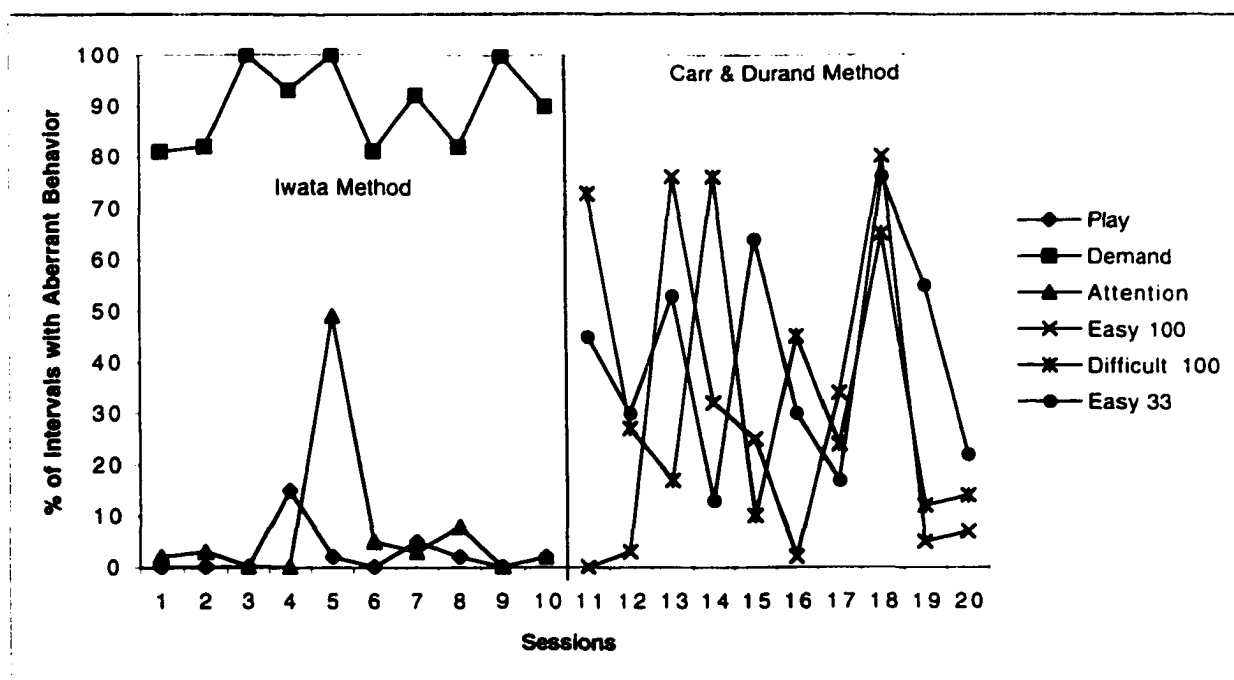


Figure 4. Experimental Functional Analyses for Darryl.

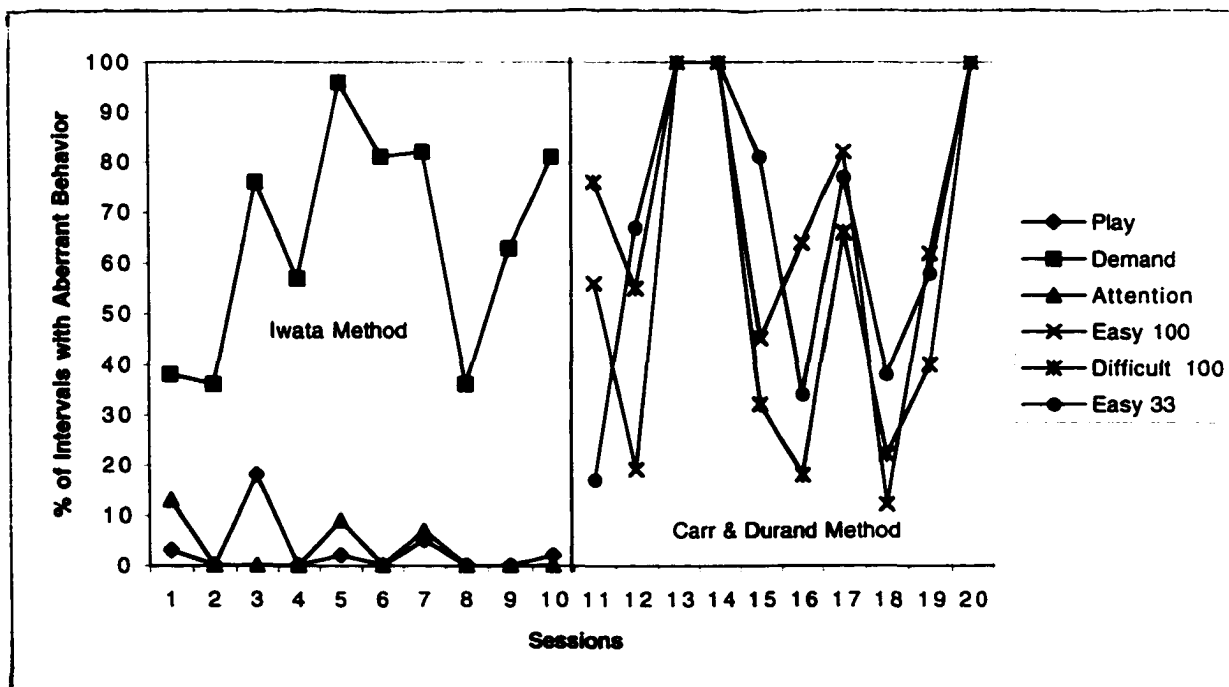


Figure 5. Experimental Functional Analyses for Larry.

In addition to these graphs, the mean percentages of aberrant behavior occurring across the conditions of each method for each participant are presented in Table 1. Based solely on the visual analysis of these graphs, which is often the only type of analysis that is undertaken in practice, and the data in the table, it would seem that the Iwata method is significantly more effective in pinpointing the variables that are maintaining aberrant behavior than the Carr and Durand method (5 out of 5, or 100% differentiation versus 1 out of 5, or 20%, respectively).

**Table 1**  
**Mean Percentage of Intervals with Aberrant Behavior Occurring**  
**Across Experimental Conditions**

Participant	Iwata Method			Carr and Durand Method		
	Play	Demand	Atten.	E100	D100	E33
Ursula	0%	39.8%	0%	7.4%	3.4%	12.7%
Dexter	0%	1.6%	39.7%	2.7%	5.8%	45.4%
Howie	0%	32.8%	0%	23.8%	10.7%	21.6%
Darryl	2.6%	90.1%	7.2%	26.4%	36.3%	40.5%
Larry	3.0%	64.6%	2.9%	64.0%	60.9%	67.2%

However, due to the comparative nature of this study, a more objective analysis of the data is warranted. This analysis can be conducted using the criteria developed for such a purpose by Hagopian et al. (1997), which were described in detail in the Method section, under the subheading "Dependent Variable." These

criteria were applied to the test conditions (demand and attention for the Iwata method, and difficult 100 and easy 33 for Carr and Durand) for each participant for each method of experimental functional analysis. The findings support those from the initial visual analysis, and are reported in Table 2.

Table 2  
Results of the Application of Hagopian et al. (1997) Criteria

Participants	Iwata Method	Carr and Durand Method
Ursula	demand	undifferentiated
Dexter	attention	attention
Howie	demand	undifferentiated
Darryl	demand	undifferentiated
Larry	demand	undifferentiated

As can be seen in this table, the standardized analysis of the Iwata method indicates that the aberrant behavior of Ursula, Howie, Darryl, and Larry is maintained by escape from academic demands, while social attention maintains Dexter's aberrant behavior. Conversely, the standardized analysis of the Carr and Durand method produces little useful information about causality; only Dexter's maintaining variable is clearly indicated. It is interesting to note that Dexter is also the only participant who seems to have a positively reinforced aberrant behavior, rather than a negatively

reinforced one, with regard to his being the only participant to have been differentiated by both the Iwata and Carr and Durand methods.

The initial evaluation of the effectiveness of the methods, therefore, was also supported by the findings of the Hagopian et al. analysis. The Iwata method resulted in unambiguous differentiation in 5 out of 5 participants, or a percentage of effectiveness of 100%. The Carr and Durand method resulted in clear differentiation of a maintaining variable in only 1 out of 5 participants, or a percentage of effectiveness of 20%.

## CHAPTER IV

### DISCUSSION

The results of the current study are clear; the Iwata method of experimental functional analysis is extremely effective in identifying the variables that maintain aberrant behavior. The rate of differentiation was 100%; this is even higher than the reported 85% success rate (Kahng & Iwata, 1999; Vollmer et al., 1995). This may be due in part to the screening process adopted in this study, which sought to pinpoint participants with relatively frequent, easily observed aberrant behavior due to the comparative nature of the study. In addition, the effectiveness of the Iwata method may have been increased by utilizing stimuli to aid in the participants in discriminating experimental conditions, as suggested by Conners et al. (2000). Further, the preference assessment, used to determine high-preference items for the control condition and medium-preference items for the attention condition, may have contributed to the method's effectiveness (Lalli & Kates, 1998).

It should be noted, however, that these refinements were not only applied to the Iwata procedure, but to the Carr and Durand method as well (specifically, the use of colored tablecloths as discriminative stimuli for the three conditions). In the case of Carr and Durand, however, they did not seem to have an impact on effectiveness. Differentiation was produced in only one of five subjects, or in 20% of the participants. This is particularly striking when compared with the Iwata method



applied to the same participants (see Figures 1-5 in the last chapter). These results are at odds with those found by researchers such as Meyer (1999), who reported 100% differentiation when the Carr and Durand procedure was used. What could be responsible for this discrepancy?

It may be the case that the criteria used to evaluate the data obtained in the study were more applicable to the Iwata method than the Carr and Durand method. The Hagopian et al. (1997) criteria for the objective visual inspection of functional analyses were developed solely in the context of the Iwata method; these criteria may not be as sensitive to the EO manipulations that characterize the Carr and Durand procedure, which may produce an effect, albeit a less pronounced one. However, looking at the graphs that directly compare the two procedures for each participant, it is hard to conclude that the issue is one of magnitude of effect. With the exception of Dexter, the Carr and Durand method produced high rates of aberrant behavior across all conditions for three of the four remaining subjects.

It is interesting to note that the participants who had undifferentiated results with the Carr and Durand procedure were all determined to have aberrant behavior maintained by escape from academic demands by the Iwata procedure. Dexter, the only participant differentiated by both procedures, had an attention-maintained problem behavior. This finding may indicate the true reason for the lack of effectiveness of the Carr and Durand procedure demonstrated in this study: EO levels may be impossible to discriminate in terms of task difficulty when demand is the maintaining variable.

In all conditions of the Carr and Durand procedure, some type of demand is placed on the participant. An interview with the classroom teacher and an independent task assessment were undertaken at the outset of the study to ensure that tasks denoted as "easy" for the participants were indeed easy (answered correctly close to 100% of the time). The same was done for difficult tasks. It may be that any demand placed on the participant, regardless of difficulty, functioned as an EO for aberrant behavior, with participants unable to discriminate between "easy" and "difficult" task demands. This hypothesis would seem to be supported by the data from the current study; it was not the case that aberrant behavior failed to occur in the difficult 100 condition, but occurred at high levels in three of four participants in all three conditions, including the control condition. As participants were screened and excluded based on any indication of an automatically reinforced aberrant behavior, this is an unlikely explanation for high rates of the target behavior in all conditions for all of these participants. Rather, it would seem that any demand evoked aberrant behavior. Or, as Kahng and Iwata (1998) posited, the experimenter's presence in itself may serve as an EO for demands, regardless of the difficulty of the task required by the demand.

Perhaps it is easier for participants to discriminate attention levels versus task difficulty, which would explain why Dexter's results were unambiguous. It may be easier to discriminate easy 100 and difficult 100 (attention every 10s) from easy 33 (attention every 30s) than to discriminate between levels of demands. However, EOs for behavior are present in every condition, including the control condition, in the

Carr and Durand procedure, while there is really no method of gauging the sensitivity of particular participants to certain EOs. It may be that the "easy" tasks need to be not only easy but enjoyable to some participants; any demand short of this worked as an EO for noncompliance. The difficulty in assessing "joy" in terms of academic tasks, which is not always relevant in terms of what a student needs to learn, is obvious.

The difference in the effectiveness of the two methods examined in this study undoubtedly result from the essential differences in the defining features of the two methods. The Iwata method relies on the A-B-C model; test conditions in this procedure for a given behavioral function contain the manipulation of both an EO (antecedent) and a reinforcement contingency (consequence) for an aberrant behavior (Worsdell et al., 2000). This A-B-C model serves as the foundation for operant conditioning, and its applicability to all types of behavior has been the impetus for the science of behavior analysis. Therefore, it is not surprising that the Iwata procedure is able to pinpoint the variables maintaining aberrant behavior with some accuracy, as the rationale upon which the procedure is based is sound and time-tested.

The Carr and Durand method, conversely, is defined by its adherence to the A-B model; antecedents in the form of EOs are varied across test conditions, but no differential consequences are provided for aberrant behavior in any condition. The idea is that these conditions of deprivation and extinction should combine initially to produce a high rate of behavior in the condition in which the maintaining EO is strongest; the indication of a maintaining variable, then is denoted by an extinction

burst in this condition. However, extinction bursting was not observed in the present study. This could be due in part to the growing evidence that extinction bursts may not be as salient a feature of behavior under extinction as it was once thought (Lerman & Iwata, 1996). In addition, high rates of aberrant behavior occurred in three of five participants throughout all three experimental conditions; perhaps the participants were not sensitive enough to the levels of EO manipulation to discriminate experimental conditions, especially with the lack of accompanying differential consequences.

Support for the effectiveness of the A-B-C model of experimental functional analysis versus the A-B model comes from recent research by Fischer, Iwata, and Worsdell (1997) as well as from Worsdell et al. (2000). Both of these studies, in the form of component analyses, found that functional analysis outcomes were clearer when test conditions contained both an EO to evoke behavior as well as a reinforcement contingency to maintain it. It is not surprising, then, that the current study finds that the Iwata method is much more effective in delineating behavioral function than the Carr and Durand method; the basic characteristics of each method nearly guarantee this result.

Thus, the comparison has been made. Though the findings of this study could have been made even stronger by including a reversal in which the findings of the functional analyses were confirmed, the prevalent and oft-refined experimental functional analysis of Iwata and colleagues has once again been upheld as the gold standard for the assessment of the variables that maintain aberrant behavior.

**Appendix A**  
**Protocol Clearance from the Human Subjects**  
**Institutional Review Board**



Date: March 12, 2002

To: Jack Michael, Principal Investigator  
Kathryn Potoczak, Student Investigator for dissertation

From: Mary Lagerwey, Chair

A handwritten signature in cursive script that reads "Mary Lagerwey".

Re: HSIRB Project Number 02-02-01

This letter will serve as confirmation that your research project entitled "Identifying the Function of Aberrant Behavior: A Comparison of Variations of the Experimental Functional Analysis" has been **approved** under the **full** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: February 20, 2003

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