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## A comparison of functional analysis results when conducted in contrived and home settings

Dana DeIngenis  
*Northeastern University*

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**A Comparison of Functional Analysis Results When Conducted in Contrived and  
Home Settings**

**A Thesis Presented**

**By**

**Dana DeIngenis**

The Department of Counseling and Applied Educational Psychology

In partial fulfillment of the requirements

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Author: Dana DeIngenis

Department: Counseling and Applied Educational Psychology

Approved for Thesis Requirements of Master of Science Degree

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Laura Dudley, MS, BCBA

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Karen A. Gould, PhD, BCBA

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Shawn Kenyon, MA, BCBA

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Dana DeIngenis

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Abstract

Recent studies suggest that the setting of a functional analysis could influence the results of the analysis (Lang et al., 2008 & Lang et al., 2009). The current study examines the results of functional analyses conducted in a home and contrived setting. An eight-year-old boy diagnosed with autism participated. The analysis identified the same function in both settings but with increased variability in the contrived setting.

A comparison of functional analysis results conducted in contrived and home settings

In 1982, Iwata and his colleagues (1982/1994) introduced the functional analysis, a protocol which allows behavior analysts to systematically examine specific functions of behavior. As Iwata et al. described the protocol, clinicians could manipulate antecedent and consequent events to examine social attention, escape from demand, and automatic reinforcement as functions of behavior, with an additional condition as a control. Increased rates of behavior under one condition suggest a possible function of behavior. Prior to the publication of Iwata et al., when the function of behavior was not understood, treatment was often ineffective (Iwata, Dorsey, Slifer, & Bauman, 1994). The ability to accurately identify the function of behavior has allowed behavior analysts to develop function-based interventions based on positive reinforcement, rather than, for example, punishment-based interventions used in the past (Iwata, et al., 1994).

Since 1982, many types of functional analyses have been introduced (Hanley, Iwata & McCord, 2003). An analog functional analysis involves the systematic manipulation of potential antecedent and consequence variables but does not take place during the individual's daily routine. Rooms used in analog functional analyses are typically rooms used solely for assessment purposes and are not within the participant's natural environment. Additionally, some functional analyses only manipulate antecedent variables without also manipulating consequence variables. Functional analyses can also take place in classrooms, homes and other locations (Hanley et al., 2003).

While the introduction of the functional analysis has changed the way behavior analysts study behavior, the traditional procedures used to conduct a functional analysis have received many criticisms (Hanley et al., 2003). For example, functional analyses are often referred to as

complicated, time-consuming, dangerous, and not ecologically valid (Conroy, Fox, Crain, Jenkins, & Belcher, 1996). In particular, Conroy and colleagues (1996) criticize analog functional analyses for devising experimental conditions that do not translate to the natural environment. In order to test this position, they compared analog functional analysis results to conditional probabilities of classroom observations. Following the functional analysis, a treatment was introduced for two of the five participants. The intervention addressed the function of behavior identified in the experimental analysis and was successful for both participants. The results revealed little correspondence between the experimental analysis and the conditional probabilities from the classroom observation and suggest that analog and classroom conditions could falsely identify different behavioral functions (Conroy et al., 1996).

Carr, Yarbrough and Langdon (1997) suggest an additional limitation of the traditional functional analysis; that is, the four experimental conditions suggested in Iwata et al. (1982/1994) may fail to identify behavioral function; instead, there may be no differentiation in the various conditions. They conducted a series of functional analyses under the traditional four conditions (attention, demand, alone and play) and discovered that the results of the analyses did not reflect reports and observations from within the classroom. After classroom observation, idiosyncratic variables were identified for each of the participants. When those idiosyncratic stimuli were incorporated into the functional analyses, the experimenters could then accurately identify the function of behavior. However, an intervention which addressed the hypothesized function was not implemented within the study. This study, nevertheless, identifies the complexity of the environment and highlights the shortcomings of a typical analog functional analysis.

Ringdahl and Sellers (2000) provide further criticism of traditional functional analysis methods. They point out that functional analyses often do not incorporate stimuli or features of the environment where the behaviors typically occur. In order to explore this observation, the effect of caregivers on functional analysis results was analyzed. Behavior was examined under the conventional four functional analysis conditions; however, a caregiver was present in only half of the sessions. Results suggest that the traditionally conducted functional analyses (without caregivers) either resulted in sessions without responding or inaccurately identified a function of the behavior (Ringdahl & Sellers, 2000).

Ringdahl and Sellers (2000) and Carr et al. (1997) conducted studies which highlight the effect that antecedent variables may have in maintaining problem behavior. In Ringdahl and Sellers' (2000) study, the presence of the participants' caregivers in the assessment sessions set the occasion for the problem behavior. For the participants in the Carr et al. (1997) study, the presence or absence of specific environmental stimuli triggered problem behavior. In 2000, Van Camp and colleagues conducted a similar study to Carr et al. (1997) in which they performed a series of functional analyses to identify antecedent variables related to their participants' problem behavior. Through multiple analyses, they found that the presence of a specific environmental stimulus (particular toys) was related to increased levels of problem behavior.

Extending the previously cited work, Napolitano and colleagues (2006) performed additional analyses of antecedent variables and problem behavior. A preliminary functional analysis suggested that access to a tangible item maintained their participant's problem behavior. After an intervention was unable to reduce problem behavior to an acceptable level, a second analysis was done-in which contextual situations identified by parents and caretakers as associated with problem behavior were examined. The results revealed that two specific

antecedent events, a wet shirt or disorganized materials, set the occasion for the participant's problem behavior. Following the analysis, functional communication training was implemented to teach an appropriate escape response in the identified conditions. The success of the intervention suggests that the functional analysis accurately identified the function of the participant's behavior.

In order to resolve some of the criticism associated with analog functional analyses conducted in clinical settings, experimenters have conducted studies in a variety of settings such as schools, vocational programs, and homes (Hanley et al., 2003). Day, Horner and O'Neill (1994) conducted a study in which all experimental sessions occurred within the participants' homes while the participants followed their typical routines. Rather than using the attention, demand, play and alone conditions, Day et al. (1994) employed four conditions that simultaneously analyzed tangible and escape functions for the participants' aggressive behavior. By manipulating antecedents and consequences within the home setting, the experimenters accurately identified the functions of the participants' aggression and implemented an effective treatment (Day, Horner, & O'Neill, 1994). The results of this study reveal that an accurate assessment can be conducted within a participant's home with little change to his or her daily routines.

Arndorfer and colleagues (1994) addressed the time-consuming nature of functional analyses in the context of assessments to identify the function of disruptive behavior in five children with developmental disabilities. First, the experimenters conducted a questionnaire and an interview with the parents. Next, both the parents and the experimenters collected observational data regarding the children's behavior including aggression, noncompliance and screaming. Finally, after forming a hypothesis from the information collected, brief functional

analyses were conducted to compare two different conditions for each child (Arndorfer, Miltenberger, Woster, Rortvedt, & Gaffaney, 1994). The conditions included high versus low attention, high versus low demand and interrupted and uninterrupted play time. The experimental analysis was conducted for 1-3 days. It took place in participants' homes and employed the parents as the therapists within the conditions. In a relatively short period of time, parents and experimenters were using descriptive assessments to develop a thorough experimental analysis of the behavior and from those results, design and implement a successful treatment (Arndorfer, et al., 1994).

In addition to being present during sessions, parents can also conduct assessment sessions themselves (Najdowski, Wallace, Doney, & Ghezzi, 2003). For example, in order to analyze food selectivity, an experimenter guided the mother of a boy with autism through implementation of an analysis and treatment program. The experimental conditions were similar to those outlined by Iwata et al. (1982/1994) and the child's mother presented all antecedents and consequences and the results revealed escape as the function of the child's behavior (Najdowski et al., 2003). Following the functional analysis, the experimenters designed a treatment which the child's parents implemented in two different settings. With assistance from the experimenter during only 2-3 meals per week, the parents reduced the child's food selectivity both at home and at a restaurant (Najdowski et al., 2003).

Parents can also assist with home-based functional analyses of typically-developing children. For example, Ellingson et al., (2000) conducted an experiment in which mothers of two children participated in the analysis and treatment of finger-sucking in two typically-developing children (Ellingson et al., 2000). The mothers delivered consequences according to the conditions of Iwata et al. (1982/1994) and an additional analysis which identified the sensory

stimulation maintaining finger sucking. The additional analysis compared levels of finger sucking when the children's fingers were free and when they had adhesive bandages covering parts of their fingers. The parents then implemented the treatment as designed by the experimenters and conducted maintenance checks that successfully decreased problem behavior.

Conducting functional analyses within an individual's home or school addresses the criticism of traditional, analog functional analyses. Numerous assessments have been successfully conducted outside of traditional analog setting; however, there may be problems with functional analyses conducted in natural settings (Hanley et al., 2003). Natural settings do not allow the level of experimental control expected of a functional analysis (Lang et al., 2008). There are many stimuli within a natural setting that cannot be controlled by the experimenter – classmates, siblings, environmental stimuli, etc (Hanley et al., 2003). While there are clear advantages of each setting, very little research has directly examined the effect of setting on functional analysis results.

Haring and Kennedy (1990) and Harding and colleagues (2005) examined the effect of setting as an antecedent variable. Harding and Kennedy (1990) compared the efficacy of a time-out (task removal) and differential reinforcement of other behavior (DRO) (task completion and omission of problem behavior) procedures implemented during task and leisure settings. Their study revealed that, for their participants, the success of the intervention was dependent upon the setting in which it was implemented, where the DRO was successful during leisure tasks and the time-out was successful during academic tasks. Harding et al. (2005) investigated the effect of child location on rate of self-injurious behavior (SIB). During preliminary functional analyses, experimenters were unable to identify the function for SIB in two children with developmental disabilities. Anecdotal accounts suggested that the child's location, either seated with a parent or

alone in a wheelchair or on a mat, may influence the rate of SIB. Additional test conditions demonstrated that for one participant, levels of SIB were higher when in her wheelchair, and for their second participant, levels of SIB were higher when he was placed on the floor rather than on a couch. The functional analysis results also allowed the experimenters to create and implement a successful intervention for both of their participants.

While the previous two studies incorporated student location into their analysis, few studies have directly examined the effect of setting on the results of a functional analysis. Lang and colleagues (2008) presented a preliminary analysis of setting effect on functional analysis results. Traditional functional analysis conditions were conducted in two settings: the students' classroom and an assessment room. During the functional analysis, the participants exhibited two response patterns in the two settings; either they showed the same function, or they showed different functions. When the same pattern is shown, it suggests that the level of experimental control of a natural setting may be sufficient to identify the function of behavior. Conversely, when the pattern is different, it suggests that behaviors may serve different functions within different settings.

Lang and colleagues (2009) tested the two possible outcomes of setting function. They conducted functional analyses of a student's problem behavior in a classroom and on the playground. In each setting, a different function was identified: attention while on the playground and tangible items while in the classroom. Subsequently, two interventions were designed to address the different behavioral functions. The two different interventions were implemented in both settings. The results revealed that each functional analysis had correctly identified the function of behavior, despite identifying a different function for the same behavior. The attention-function based intervention was successful while on the playground but not in the

classroom and the tangible-function based intervention was successful in the classroom but not on the playground. Based on the work of Lang and colleagues (2008, 2009) further research on the influence of setting in results of functional analysis is necessary. The purpose of this study is to extend that research and compare functional analysis results across two settings: a contrived setting and homes.

## Method

### *Participants and Settings*

Sam was an eight-year-old boy diagnosed with autism who attended a day school for individuals with development disabilities. He received up to six hours per week of instruction in his home based on the principles of applied behavior analysis. Sam communicated with 3-4 word sentences. Sam's caregivers and service providers recommended him for the present study because his motor stereotypy, finger flicking, significantly interfered with his learning sessions and daily life. Other challenging behaviors were not ignored during assessment sessions. The same therapist conducted all of the sessions.

Sam's contrived sessions were conducted in a designated assessment room in his school. The room contained a table, chairs and the materials for each condition. Sam's home sessions were conducted in the dining area of his home which is where his typical home instruction sessions take place. The room contained a table, chairs, and the materials for each condition. The same materials were used for each condition across both settings, which were play-doh, puzzles, Legos and a book.

### *Response Definitions and Measurement*

Finger flicking was defined as repeated up-and-down or back-and-forth contact of one or more fingers against any object. Due to the high rate of Sam's finger flicking, all of his sessions

were videotaped. Data were collected from the videotapes using a 10-second interval partial-interval recording system. The data were then converted to a percentage by dividing the number of intervals with recorded behavior by the total number of intervals then multiplying by 100.

#### *Inter-observer Agreement*

Inter-observer agreement was collected during 40% of Sam's functional analysis sessions. A second, independent observer viewed the video-tapes and recorded data. An interval-by-interval analysis was completed, and inter-observer agreement was calculated by dividing the number of intervals with agreement by the total number of intervals and multiplying by 100. Mean interobserver agreement for target behavior across settings and conditions was 95% (range, 73%-100%). Procedural integrity data were also collected during 40% of Sam's sessions from the video-tapes. An observer coded the experimenter's behavior on a task-analysis developed from implementing a functional analysis. Procedural integrity across settings and conditions was 100%.

#### *Functional Analyses*

Finger flicking was assessed during 5-minute sessions in both the home and the contrived settings. The conditions used were similar to those described by Iwata et al. (1982/1994). During all conditions, Sam was seated at a table with the experimenter seated next to him. During the attention condition, a variety of toys were available to the participant. The experimenter instructed the child to play while she did some work, then assumed the appearance of reading a book (i.e. she held and looked a book and occasionally turned a page). Contingent upon the occurrence of finger flicking, the experimenter said, "Hands down," and then returned to her reading material.

For the escape condition, functional activities were selected by the student's home therapists. The academic task was construction of Lego structures from pictures. At the start of each trial, the experimenter gave the participant a set of Legos and a picture and delivered the instruction, "Build this," or "Make this one." A rotation of 3-4 learned structures were used for assessment sessions. After the delivery of the instruction, if the participant did not respond within 5 seconds, a gesture prompt was provided. If the participant did not respond within 5 seconds of the gesture prompt, the experimenter physically prompted him to complete the task. If Sam made a mistake while building the structure, a gesture prompt was provided to correct the mistake. Social praise was delivered if the participant completed the task, independently or prompted. If the student engaged in stereotypy, the experimenter terminated the task and removed the materials for 10 seconds. Academic tasks were presented at a rate of approximately one every 30 seconds.

In the play condition, no academic tasks were presented, and the student had free access to preferred toys and stimuli. The experimenter delivered verbal praise every 30 seconds and ignored all challenging behaviors. The experimenter also manipulated materials during the session.

The alone condition differed slightly between the contrived and the home settings. During the contrived sessions, the student was in the session room, without access to toys or adult attention. The experimenter observed the participant through a two-way mirror. During the home sessions, all of the preferred toys and stimuli were removed from the room to create a non-stimulating environment similar to the empty room in the contrived sessions. The experimenter observed the session, but was out of the participant's sight. Because sessions were

conducted in an open room, the experimenter instructed Sam to sit down if he stood up; she ignored all other behavior.

Levels of stereotypy were examined in each condition using an alternating treatments design. The effect of setting on results was analyzed in an ABAB reversal design, with A representing the home and B representing the contrived setting. The participant was exposed to the same number of sessions in each setting, and the order of sessions was the same in each location.

### Results

Results for Sam's functional analysis are presented in Figure 1. In both the home and contrived settings, the highest rates of stereotypy occurred in the alone sessions ( $M = 74.6\%$ , range: 13% - 100% and  $M = 75.1\%$ , range: 43%-93%, respectively). Sam also engaged in finger flicking behavior in each of the other conditions in both settings, but at lower rates. Table 1 displays the average percentage of intervals with finger flicking behavior within each setting and across all conditions. While the average occurrence of stereotypy is almost identical in the demand, play, and attention conditions in the contrived setting, the range of the rate of stereotypy in each of these conditions is significantly higher when compared to the home setting.

### Discussion

The current study extends the research of Lang et al. (2008) and Lang et al. (2009) by comparing functional analysis results across two settings, home and contrived. Functional analyses were conducted in the participant's home and in a contrived setting and data across the two environments were then compared. The results of the functional analyses revealed the same function of behavior in both settings, suggesting that setting does not influence the function of the behavior for this participant. The alone condition yielded the highest rates of finger flicking

behavior in every session except for two. When alone in one of the contrived setting sessions, Sam engaged in lower rates of finger flicking behavior; he was observed examining the room, i.e. the lights and the mirror. During the demand condition of this session, Sam completed 4 trials, compared to completing 9-10 trials in other demand conditions. In one of home setting sessions, Sam engaged in low rates of finger flicking behavior in all assessment conditions. This may be attributable to the activities that occurred prior to the assessment sessions. Prior to that set of assessment sessions, Sam engaged in a high level of physical exercise. His energy level during the assessment sessions that followed was visibly lower than during typical assessment sessions. Despite the two irregular sessions, Sam consistently engaged in high rates of finger flicking behavior while he was alone, suggesting that the function of his behavior may be automatic reinforcement.

Further examination of the data reveals that within the contrived setting there was increased variability in the rate of behavior Sam exhibited in the attention, demand and play conditions. Sam's parents had a rule in their home that he was not allowed to engage in finger flicking behavior when he was around other people. Therefore, within his home, the presence of people could be a discriminative stimulus to engage in other, non-flicking behaviors.

There are several limitations to the current study. First, there was only one participant. While results of this participant's functional analysis did not vary based on settings it is unclear whether other individuals would produce the same results. Also, the current participant's target behavior was maintained by automatic reinforcement. Problem behaviors maintained by social variables may be sensitive to different social variables across different settings. Next, the experimenter was a familiar person and conducted all of the assessment sessions. This situation could create two potential problems. First, the contrived sessions were conducted in a room in

the participant's school where the participant typically did not encounter the experimenter. The familiar person may have masked any controlling properties of the novel setting. Next, the experimenter could have acted as a discriminative stimulus either for engaging in flicking behavior or not engaging in flicking behavior, due to prior history. Because the experimenter was present throughout the play, attention and demand conditions, she could have been a discriminative stimulus in each condition, regardless of the consequences. Finally, due to the high levels of variability of stereotypy within all of the conditions, the participant may not have been able to discriminate between the assessment conditions.

Future research should continue to examine the relationship between functional analysis results when conducted across settings. Future research should include more participants who engage in different types of problem behavior, i.e. aggression, disruption, property destruction, etc. As stated previously, behaviors maintained by social consequences may be more sensitive to different contingencies across different settings. Also, results from functional analyses conducted in home should be compared to analyses conducted in other settings, such as schools or community settings. Problem behaviors often occur in different settings, and as such it is important to determine if the function of behavior differs depending on the settings. It is important to identify different functions based on setting because each setting may need a different intervention. In addition, the results of a functional analysis should be verified through the outcomes of intervention, particularly in the case of conflicting results. A successful intervention confirms the results of the analysis whereas an unsuccessful intervention suggests that results from the assessment derived false hypotheses as to the function of behavior.

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Table 1  
 Mean Percentage of Intervals with Target Behavior

Conditions	Home	Contrived
Attention	19.7% (range, 6%-47%)	23.9% (range, 0%-73%)
Demand	23.2% (range, 6%-73%)	23.9% (range, 0%-80%)
Play	16.2% (range, 0%-70%)	22% (range, 0%-60%)
Alone	74.6% (range, 13%-100%)	75.1% (range, 43%-93%)

Figure Captions

*Figure 1.* Results of the functional analyses conducted in the home and contrived setting.

